

SIEMENS TRAFFIC CONTROLS

667/HB/30325/000

Sopers Lane

Poole

Dorset

BH17 7ER

PRODUCT: Siesign 150

Siesign 150

HANDBOOK

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<u>Issue</u>	<u>Change Ref.</u>	<u>Date</u>
a		27-1-2003
1		25/11/03

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SAFETY WARNING

HEALTH AND SAFETY AT WORK

DISCONNECT ALL POWER TO THE DRIVER MODULE BEFORE REMOVING THE LID.

Safety of Maintenance Personnel

In the interests of health and safety, when using or servicing this equipment the following instructions must be noted and adhered to:

- (i) Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989.
- (ii) Such personnel must take heed of all relevant notes, cautions and warnings in this Handbook and any other Document or Handbook associated with the equipment including, but not restricted to, the following:
 - (a) The equipment must be correctly connected to the specified incoming power supply.
 - (b) The equipment must be disconnected/isolated from the incoming power supply before removing any protective covers or working on any part from which the protective covers have been removed.
 - (c) This equipment contains a Lithium battery that must be disposed of in a safe manner. If in doubt as to the correct procedure refer to the Siemens instructions CP No. 526.
 - (d) Any power tools must be regularly inspected and tested.
 - (e) Any ladders used must be inspected before use to ensure they are sound and not damaged.
 - (f) When using a ladder, before climbing it, ensure that it is erected properly and is not liable to collapse or move. If using a ladder near a carriageway ensure that the area is properly coned and signed.
 - (g) Any personnel working on site must wear the appropriate protective clothing, e.g. reflective vests, etc.

In the event of more than one person working on the equipment, the Mains Supply to the Driver Module must be disconnected by removing the fuse.

More specific safety information is given within the text of the handbook, where it relates to particular activities or situations.

Safety of Road Users

It is important that all personnel are aware of the dangers to road users that could arise during repair and maintenance.

Signing and Guarding shall be to Highways Agency TSM Chapter 8

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1. INTRODUCTION

1.1 Scope of the Handbook

This handbook provides technical information and procedures required for installation and maintenance of the Siesign 150 Variable Message Product. It is recommended that persons required to install and maintain this equipment attend a training course. This handbook acts as a reference document for those who have attended such a course.

This document does not cover:-

- Site planning
- Design of Sign Face
- Erection of the poles
- Fitting the sign face to the poles
- Installation of or connection to the Electricity Supplier's fusing

The handbook covers:

- An overview of the Siesign 150 system.
- Installing the mains distribution equipment.
- Installing the Driver module onto the rear of the panel.
- Installing the Display modules.
- Commissioning the site.
- Routine Maintenance.
- Fault finding and replacement of modules (first line maintenance).
- References to drawings, part numbers, spares etc

1.2 Related Documents

BS7671:2001	IEE Wiring Regulations
667/HE/20664/000	Installation & Commissioning Handbook No.4 Installation Testing (General)
667/GC/30326/000	Siesign 150 Mechanical Build document
Chapter 8	Highways Agency Traffic Signs Manual - Signing and Guarding
667/DZ/30325/ETC	Siesign 150 Family tree
667/DA/30325/ETC	Siesign 150 Power distribution
667/DA/30330/ETC	Siesign 150 Driver Module circuit diagram
667/DB/30330/ETC	Siesign 150 Driver Unit wiring diagram
667/DA/24620/ETC	Processor circuit diagram
667/DA/28547/ETC	Battery Charger pcb circuit diagram

1.3 DEFINITIONS

- Driver Module The unit containing the processor pcb, modem mains power supply unit.
- Display Module The unit containing the display pcbs

1.4 ABBREVIATIONS

- CPC Continuity Protective Conductor
MCB Miniature Circuit Breaker
MDU Mains Distribution Unit
RCD Residual Current Device
VMS Variable Message Sign

1.5 Recommended Tools and Test Equipment

It is recommended that the tools listed here should be acquired if not already in the Engineer's toolbox.

TITLE	PART NUMBER
Tri head key	
Dusting Brush	4/TL0007
Junior Hacksaw	4/TL0029
Soldering Iron	4/TL0038
No.1 Pozi Screwdriver (Insulated)	4/TL0041
No.2 Pozi Screwdriver (Insulated)	4/TL0042
Phoenix Screwdriver	Phoenix SZS 0.4 x 2,5
Terminal Screwdriver (Insulated)	4/TL0044
Electrical Screwdriver (Insulated)	4/TL0045
IC insertion/extractor tool.	4/ST1244
Socket Set 1/4" drive (Typically BH04-2420)	
Socket 17mm (3/8" or 1/2" drive)	
Extension bar and driver for above	

The following test equipment is required

Digital Multimeter capable of reading 250V or greater,
current to (10A) and continuity to 2 decimal places
Insulation Tester
Earth Loop Impedance Tester
RCD Tester

Megger BM222 or similar
Megger LT5 or similar
Seaward RC500 or similar

Diagnostic Terminal PC

Laptop PC used for configuring the character pcbs and testing the sign.

VMS Maintenance Kit (667/1/29132/000). This comprises:-

1	667/1/29133/000	DIAGNOSTIC CABLE ASSEMBLY	1 off (2 D types plus cable)
2	667/1/29134/000	RS485 KIT	1 off
3	667/1/27791/000	VMS INTEL CHAR CONFIG C/FORM	1 off
4	667/1/29138/000	MAINS EXT CABLE ASSEMBLY	1 off

Item 2 comprises:-

667/1/29135/000 COMPUTER CABLE ASSEMBLY:-

1	508/4/23297/000	CONNECTOR D TYPE PLUG 9 WAY SO	1.0000
2	508/4/23297/010	CONNECTOR D TYPE SOCKET 9 WAY	1.0000
10	531/4/03077/000	CONNECTOR-ACC HOOD FOR D TYPE	2.0000
20	998/4/82549/006	CABLE SUB-MINIATURE 7/0.2MM 4	5.5000
100	667/GA/29135/000	COMPUTER CABLE	

and 667/1/29136/000 CONVERTER ASSEMBLY:-

1	667/1/29137/000	INTELL CH ADAPTER CABLE ASSY	1.0000
10	509/4/08948/000	CONVERTER ISOLATED RS232-RS422	1.0000
15	605/4/08667/000	P-S-U PLUG TOP 12V 300mA UNREG	1.0000
17	508/4/23297/010	CONNECTOR D TYPE SOCKET 9 WAY	1.0000
18	531/4/03077/000	CONNECTOR-ACC HOOD FOR D TYPE	1.0000
20	915/4/98105/006	CABLE-ACC CLIP 5/16 IN I/D BLA	2.0000
25	403/4/03599/072	RESISTOR M-FILM MFR4 1K OHMS 1	2.0000
30	998/4/20075/501	WIRE PVC 16/0.2MM RED IN MAX O	1.1000
31	998/4/20075/506	WIRE PVC 16/0.2MM WHITE IN MAX	1.2000
40	998/4/15005/211	SLEEVING EXT SILICONE 1.0MM PI	0.1000
100	667/GA/29136/000	CONVERTER ASSEMBLY	0.0000

2. OVERVIEW

2.1 Arrangement

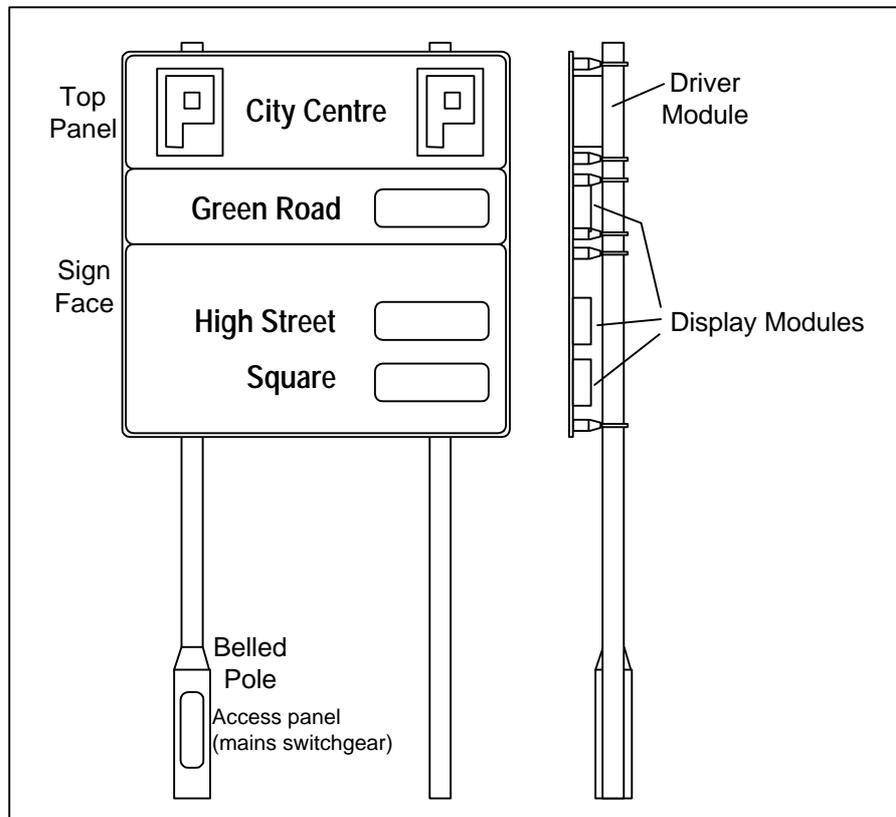


Figure 1 - Sign

The Siesign 150 sign equipment is a modular system comprising a Driver module and up to 6 Display modules fixed to the rear of a flat panel sign installation. The sign face is made up of individual panels fitted to the poles with extruded aluminium sections.

One of the supporting poles has a wide section at the base to accommodate the Electricity Supplier's fuse, the Master Switch and a 13 Amp socket for powering test equipment etc. . The pole base also has a socket connected to the Diagnostic terminal of the processor board to allow access to the fault log etc without accessing the top of the sign.

On each site a single Driver Module is fitted to the top panel of the sign. Each Driver Module has 6 cable glands, allowing a maximum of 6 Display Modules to be utilised.

Each Display Module contains 2 LED based display boards each having three 7 x 5 dot matrix characters, i.e. 6 alphanumeric characters per Module.

2.2 Block Diagram

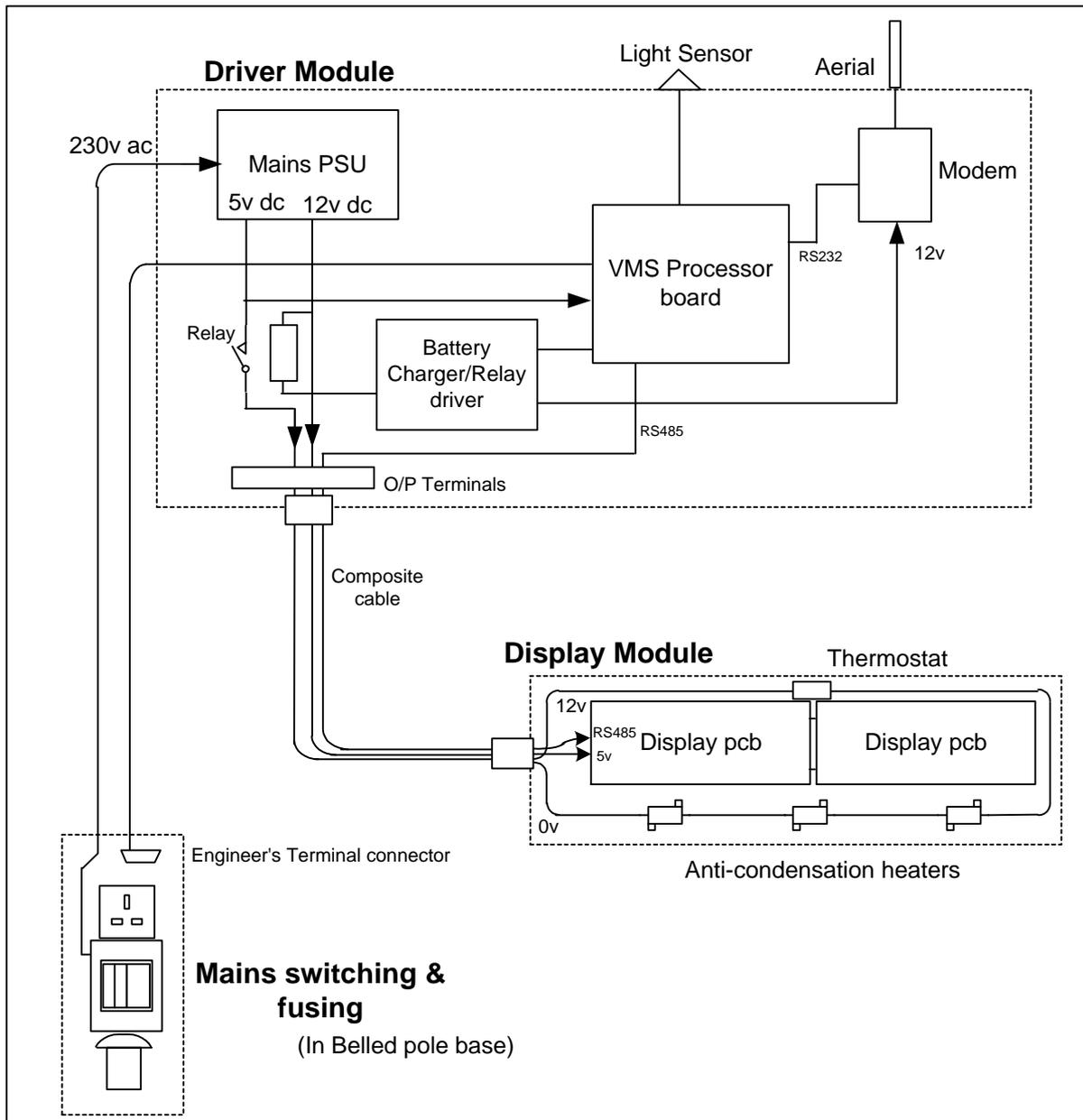


Figure 2 - Block diagram

2.3 Driver Module

The Driver module contains the mains power supply, a processor board a battery charger/relay driver board and the modem.

The power supply provides 12 volts and 5 volts dc. Both are high current outputs. Up to 12 Amps at 12 volts is required for the heaters in the displays and a nominal current is used by the modem. The 5 volts provides the LED drive current as well as providing the logic supply for the processor and display. Extensive fusing is provided on both supplies as the short circuit currents from the power supply are more than 25A (12v) and 60A (5v).

The processor board is the standard board also used for Motorway VMS and Urban 'extrusion signs'. Four serial ports are present, allocated as follows:-

Serial channel 1	RS485 isolated	Not used
Serial channel 2	RS232	Modem (Comms to Instation)
Serial channel 3	RS232	Diagnostics Terminal
Serial channel 4	RS485	Coms to Display boards

An on-board lithium battery supports the real time clock and the RAM used for the fault log.

Provision is made for a rechargeable backup battery to provide power for the processor and modem only. This option is not yet available but the battery charger pcb is fitted as it also contains the relay drive circuits.

The Modem depends on the customer's requirements but at the time of release of this handbook only 'radio' types are used, i.e. there is no land line option.

2.4 Display Module

Each Display Module contains 2 LED based display boards each having three 7 x 5 dot matrix characters, i.e. 6 alphanumeric characters per Module. The pcbs contain all components required for decoding into row and columns and driving the LEDs. Anti condensation heaters are provided to minimise condensation on the character window. A thermostat is used to disconnect the heating in warm conditions

Power and serial data are sent to the Display Module using a composite cable containing 4 power cores and a twisted pair for data.

As the RS485 line is routed to all display boards, each board must have its own unique address. This is programmable using a separate port on the board. The address is stored on board in non-volatile RAM.

The anti-condensation heating takes the form of 3 wirewound resistors fitted to the bottom support rail. These are connected in series, via a thermostat on the top rail, to the incoming 12 volt supply.

3. SPECIFICATION

3.1 Optical

The sign meets the requirements of the DoT Specification TR2136 and European Specification TCC226 for optical performance, measured to the CIE 1931 Chromaticity Chart.

3.2 Electrical

Mains voltage	80-264v
Frequency	47-63Hz
Current	1.8A max (see sect 3.5 for site specific current calculation)
Maintenance socket	BS1363 socket - max current 6A, protected by 30mA RCD

3.3 Environmental

Temperature range	-15 to +60°C
Humidity	0 to 100% Condensing
Protection	IP56

3.4 EMC

To EN50293

3.5 Site Current Calculation

The current required to drive a UVMS is made up of three components:

- (a) that required to run the electronics
- (b) that required to power the heaters
- (c) that required to illuminate the LEDs when a message is being displayed.

- (a) **Electronics**
Estimated as being equivalent to 1.5A at 5V continuous or 7.5W. Allowing for 75% efficient power supply gives 10 watts at 230V.
- (b) **Heaters**
Each display draws 2 Amps at 12 volts when the heaters are active, i.e. 24 watts. This equates to 32 watts per display at 230v. The heaters come on when the temperature at the top of the display falls to 20°C and switch off again when the temperature rises to 30°C. Note that self heating of the display and solar heating mean that these limits do not correspond directly to air temperatures.
- (c) **LEDs**
The average number of LEDs illuminated when a character is activated is 15. For the intelligent character signs the power is derived from a 5V power supply at 28mA per pixel. This gives 2.8 watts per character at 230V.

These figures can be used to calculate power consumption for a particular sign usage, and an example is shown below:

Example

A sign with three displays (of 6 characters) showing car park vacancies from 7am to 11pm and blank the rest of the 24 hours. The heaters are on for 24 hours

Electronics	24 hours at 10w	= 0.24kWh
Heaters	24 hours at 96W	= 2.30 kWh
LEDs	16 hours at 3 x 6 x 2.8W	= 0.81 kWh
Total power usage for 24 hours		= 3.35 kWh

4. INSTALLATION

4.1 Installation of poles

Installation of the poles and fitting the panels to the poles is outside the scope of this handbook.

4.2 Installation of Mains Distribution Unit

4.2.1 Safety

Full G39 procedures to be used.

4.2.2 General

Connection to the Mains supply is via the MDU fitted into the base of the belled pole. Access requires a tri-head key.

The MDU comprises a pre-built plate with a wooden board, a two pole switch, a fuse for the sign and a combined 30mARCD and 6A MCB for the maintenance socket. Part number is 667/1/30570/000.

The MDU comes with a polythene bag containing:-

- 2 M6 plain washers
- 1 M6 shakeproof washer
- 1 M6 nut,
- 2 M10 x 25 hex head screws
- 2 10mm plain washers

The pole must be equipped with 2 off plates, having M10 threads to accept the MDU.

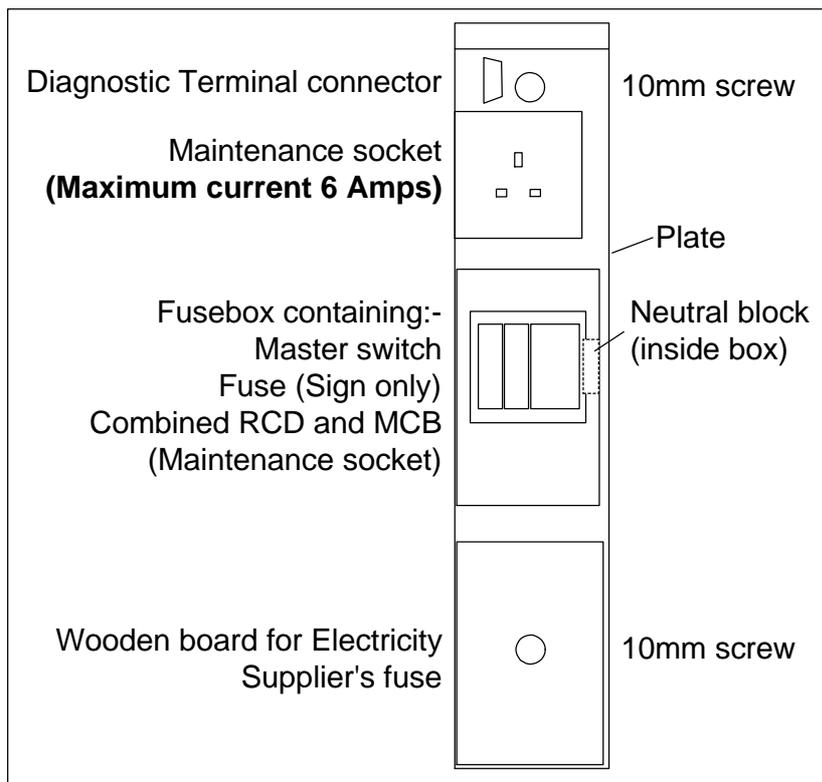


Figure 3 - Mains Distribution Unit

The plate must be installed prior to the Electricity Supplier installing the incoming mains supply. A wooden board is provided for the Electricity Supplier's cutout and tails are provided to make to the cutout.

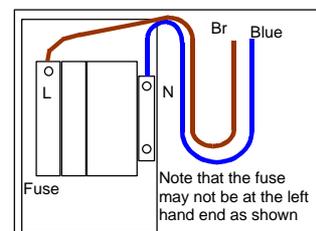
4.2.3 Installation

Offer the plate through the aperture in the pole base and secure with the two 10mm hex head screws and washers. Connect one of the earth wires to the earth stud on the pole and the other to the earth stud on the door

The mains cable feeding the sign is a three core cable with a flexible armour. Secure the cable to the plate and connect the armour and the green/yellow wire to one of the earth studs.

Remove the front panel of the fusebox. Ensuring that there is a swan neck to prevent water running into the box, route the brown wire to the fuse and the blue to the neutral block.

Replace the cover.



Route the Diagnostic terminal cable to the top of the MDU and fit the connector onto the two pillars.

4.3 Installation of Driver Module

4.3.1 Safety

Installation of the Driver unit requires the Installer to work at a height that depends upon the site design. Only persons who are suitably experienced and trained to use suitable access equipment must undertake this work.

4.3.2 Fitting

Refer to the Siesign 150 Mechanical Build Document 667/GC/30326/000.

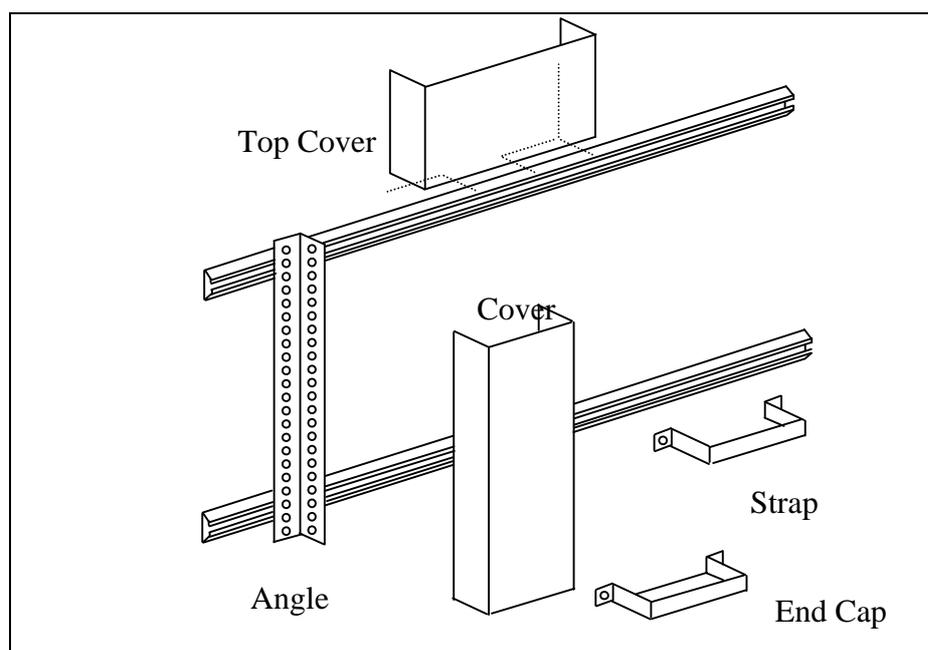
Offer the Driver Unit to the studs on the top panel so that the light sensor is at the top and secure with the nuts and washers supplied with the unit.

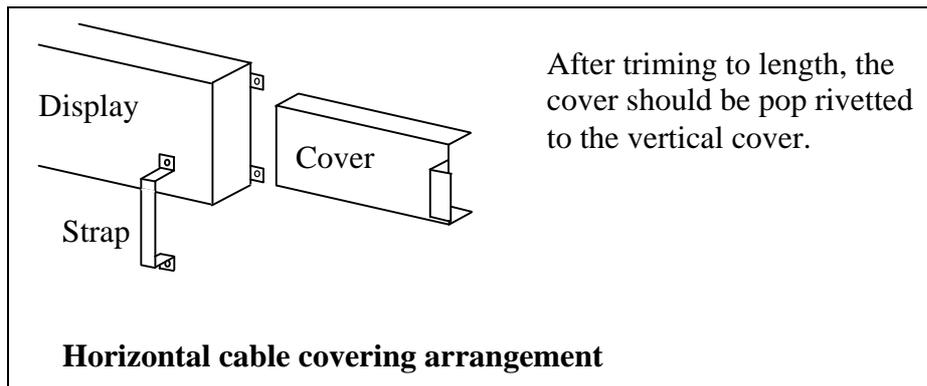
4.3.3 Wiring

Wiring to Displays

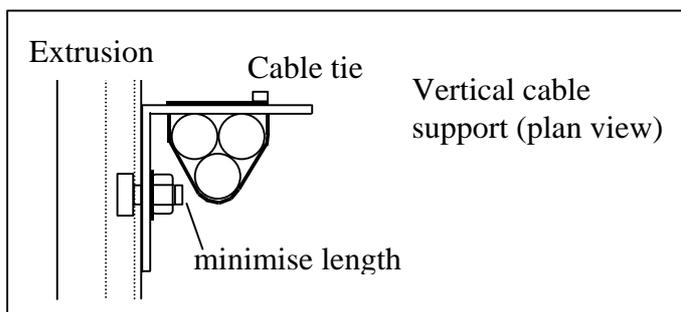
The Driver Module is supplied unwired - the cable entries have blanking plugs. The Display Modules have the cables attached and the cable glands are loose on the cables. The cables are supported and protected with a cable handling system. This has to be built up on site from the items supplied. The cable handling system covers all cables to minimise vandalism and to present a neat appearance.

The system is based on an aluminium angle section aluminium covers. It is fitted to the aluminium extrusions on the top and bottom of the sign plates using "T" bolts.





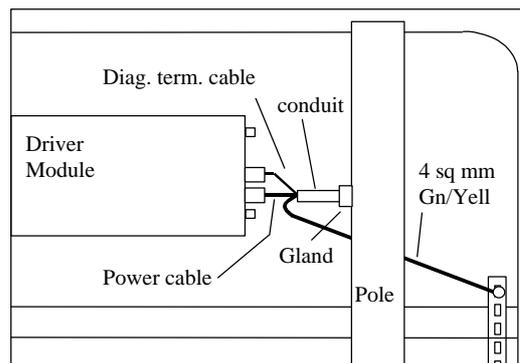
The supporting angle should be fitted to the extrusions using "T" bolts, washers and nuts. A short bolt should be used to prevent obstructing the angle as this area is required for cables:-



Each display may be connected any terminal blocks in the Driver Module. The top Display Unit would normally go to the leftmost cable gland but it is allowable to use any cable gland for any cable. The other consideration is that if only one or two displays are to be fitted, the top cover is not needed.

Wiring to pole base

At the top of the belled pole, route the flexible armoured power cable and the Diagnostic terminal cable through the flexible conduit and gland and drop down to the MDU at the base. Do not offer the cable gland into the pole aperture at this stage. Pass the 4 sq mm green yellow earth cable through the conduit. Secure the cable gland on the end of the conduit into the pole aperture.



4.4 Installation of Display Module

4.4.1 Safety

Installation of the Driver unit requires the Installer to work at a height that depends upon the site design. Only persons who are suitably experienced and trained to use suitable access equipment must undertake this work.

4.4.2 General

The pcbs in the display modules are programmed with an address so the modules must be fitted in the correct position. For a new site they are marked prior to delivery. If it is necessary to use an unprogrammed display then the address must be set up.

Refer to the details and notes on the Siesign 150 Mechanical Build Document 667/GC/30326/000 .

Offer the Display Unit to the studs on the panel (vent downwards) and secure with the nuts and washers supplied with the unit. Note that normally the cable enters the Display Unit on the right hand side. If required the cable can be re-routed internally so that it enters on the left hand side. If this is required, remove the rear panel, slacken the cable gland and pull the cable through the gland into the box. Swap the cable gland with the blanking plug from the hole on the other side of the box. Run the cable along the bottom of the box (inside) and through the gland. Retighten the gland.

4.5 Installation Electrical Testing

Document 667/HE/20664/000 covers installation testing of traffic control equipment. It includes procedures concerning tests associated with traffic signal poles, Controller startup etc which are not relevant to VMS Signs. Installation testing of the Siesign 150 signs generally follows the procedures in this document. The following sections cover particular procedures regarding the signs.

4.5.1 Visual Inspection

Before commencing electrical testing visually inspect as follows:-

Earth connections to be securely made off:-
All panels to the earthing strip.

The green/yellow earth wire exiting the belled pole top to the earthing strip.
The bottom end of the same green/yellow earth wire to the Pole earth stud. The Mains Distribution Unit to the Pole earth stud.
The maintenance socket earth to the Mains Distribution Unit.
The straight pole to the top panel earth stud.

Mains Distribution Unit to be mechanically secure.

4.5.2 Insulation Test

Preparation

This test is to be carried out prior to connecting the tails being connected to the Electricity Supplier's fuse.

Remove the Switch Cover from the mains components.

Ensure the Mains Isolation Switch and the RCD are switched on and that the 'sign' fuse is in place.

Test

Connect the live and neutral tails together. Switch the Master Switch on. With the Insulation test instrument (set to 250V operation) carry out the following tests:

- Connect between the main ground stud and the Mains/Neutral tails.

Test insulation impedance. It must be greater than 10 megohms. Record the value in the Installation Test Results form.

4.5.3 Polarity Test

The object of this test is to check that the sign is connected to Line and Neutral in the correct sense.

At the master switch check that the voltage measured from Line to Earth is approximately 240V AC and the voltage measured from Neutral to Earth is less than 10V AC.

4.5.4 Earth Loop Impedance Test

Earth Loop Impedance tests are carried out at any points in the system where mains and exposed metal work are present. The fault path within the installation comprises of the live conductors, control equipment and the CPC. The fault path external to the installation (Z_e) contains the supply authority's transformer windings, the live conductor and CPC of the supply authority's distribution network, or the earth electrode. The Earth Loop Impedance test will include both elements described above.

The Earth Loop Impedance test results are required to ensure that in the event of an earth fault (or a short circuit fault) the protection devices e.g. fuses will disconnect within the time limit as specified in BS7671 (IEE Wiring Regulations).

For fixed equipment such as the Siesign 150 equipment, the specified disconnection time laid down by BS7671 is 5 seconds and for equipment connected via sockets the specified disconnection time is 0.4 seconds.

This test is carried out after the Electricity supply has been installed.

Preparation

After ensuring that the cable is not live, connect mains to the sign's distribution box. The sign should be switched on and operating normally unless otherwise stated in the following subsections.

SAFETY

During the test ensure that NO person is in contact with any part of the sign or the mounting pole.

4.5.4.1 Tests at Base of Belled Pole

Using an LT5 tester or equivalent: Connect the Red probe to the Live input at the Mains Isolation Switch and the earth test probe of the tester (Black probe) to the following points in turn and carry out an Earth Loop Impedance Test for each point:

- (a) Main Earth on MDU
- (b) Earth stud on Pole
- (c) Earth pin of the maintenance socket

The maximum allowable value is 5.08Ω (based on BS88 fuse and 5 seconds disconnect time).

If the measurements exceed this value, do not proceed with further testing and report the supply as out of specification to the customer concerned.

If the supply Company can not improve the characteristics of the supply, then a permissible solution is to fit a 300mA RCD to protect the whole installation. However this will require a separate Mains pillar as there is no room within the belled pole.

The maximum allowable earth loop impedance of an installation following an in-line RCD is calculated using the following formula:

$$Z = \frac{50 \times 1000}{I(\text{mA})}$$

Where $I(\text{mA})$ is the operating current in milliamps for the RCD.

Note: For 300 mA RCD is recommended not to exceed 100Ω and for a 30 mA RCD it is recommended not to exceed 1000Ω .

Note: 30mA RCD is not recommended on a sign as nuisance tripping can occur.

4.5.4.2 Tests at Driver Module

SAFETY

During the test ensure that NO person is in contact with any part of the sign or the mounting pole.

Using an LT5 tester or equivalent: Connect the Red probe to the Live input at the mains terminal block and the earth test probe of the tester (Black probe) to the following points in turn and carry out an Earth Loop Impedance Test for each point:

- a) Earth stud on panel
- b) Case of mains psu close to mains input
- c) One of the fixing studs used to fix the module to the sign face.

The maximum allowable value is 5.08Ω (based on BS88 fuse and 5 seconds disconnect time).

4.5.5 Maintenance Socket RCD Test

This test is performed with the Seaward RC500 or similar meter. The test measures the actual disconnection time of the RCD.

Connect the RCD tester into the maintenance socket. Set the test trip current to 30mA, press test button: The maximum allowable trip time is 0.2 seconds.

Reset the RCD. Set the trip current to 150mA and re-test: The maximum allowable trip time is 0.04 seconds.

If either test fails replace the RCD.

5. COMMISSIONING

5.1 Safety precautions

Only suitably trained people are to carry out this work. This must include full safety precautions when working on the Sign and its associated electronics.

5.2 Pre-commissioning checks

This section first describes the function of each Siesign 150 PCB switch and LED and describes which should be set in each situation.

5.2.1 Processor PCB LEDs

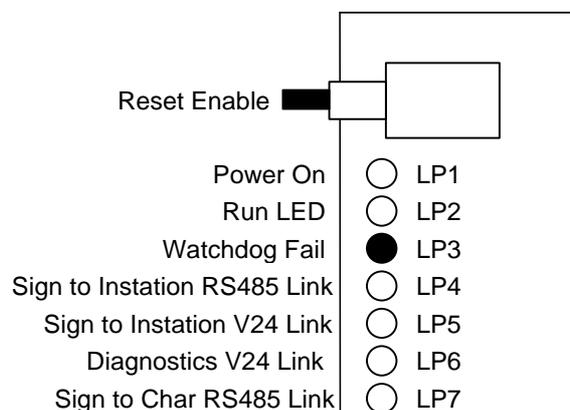


Figure 4 - Processor PCB LEDs

- "POWER ON" LED indicates that both the logic 5V **and** PCB 12V are present on the processor PCB.
- "WATCHDOG FAIL" LED is lit if the software fails to trigger the watchdog circuit.
- The link LEDs pulse when data is being transmitted by the PCB onto the link.
- LP7 should flash briefly every 5 seconds.

5.2.2 Processor PCB Switches

The processor PCB has a bank of DIL switches labelled S2, S3 and S4 on the PCB's silkscreen.

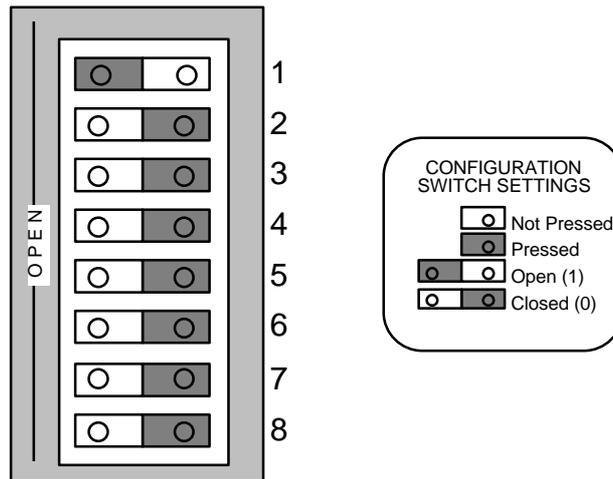


Figure 5 - Processor PCB Switches

Address switches (S2) define the address the sign will respond to:

- 1) No two signs on the same link may have the same address.
- 2) Switch 1 is the least significant bit.
- 3) Switch 8 is the most significant bit.
- 4) Address 00 Hex is invalid. (all switches closed)
- 5) Address FF Hex is invalid. (all switches open)

Address Switch		
S2	1	LSB
	2	
	3	1=open
	4	0=closed
	5	
	6	
	7	
	8	MSB

Luminance level switches (S3) allow adjustment of the lantern and character LED light outputs. The luminance level is determined by the ambient light level sensors. Level 1 corresponds to low light levels and level 4 to high light levels. For each light level one of four sub levels may be set. The light output for both LEDs and lanterns defined by the sub levels is determined by the configuration EPROM and can be changed.

For Siesign 150 signs always set the luminance switch S3 to all 8 bits being closed.

Note: The diagnostic terminal can be used to determine which luminance level the sign is operating in by selecting the Monitor Light Sensors option (See Appendix A4.4.4).

Luminance Level Switch

5 - 8	Sets EMI Type - Not Used for Siesign150 Set to all CLOSED.
-------	--

- Reset Enable and Reset switches reset the sign when pressed simultaneously.

5.2.3 Signs Driven from OTU only

Wire between the sign and the OTU as shown in Figure 6.

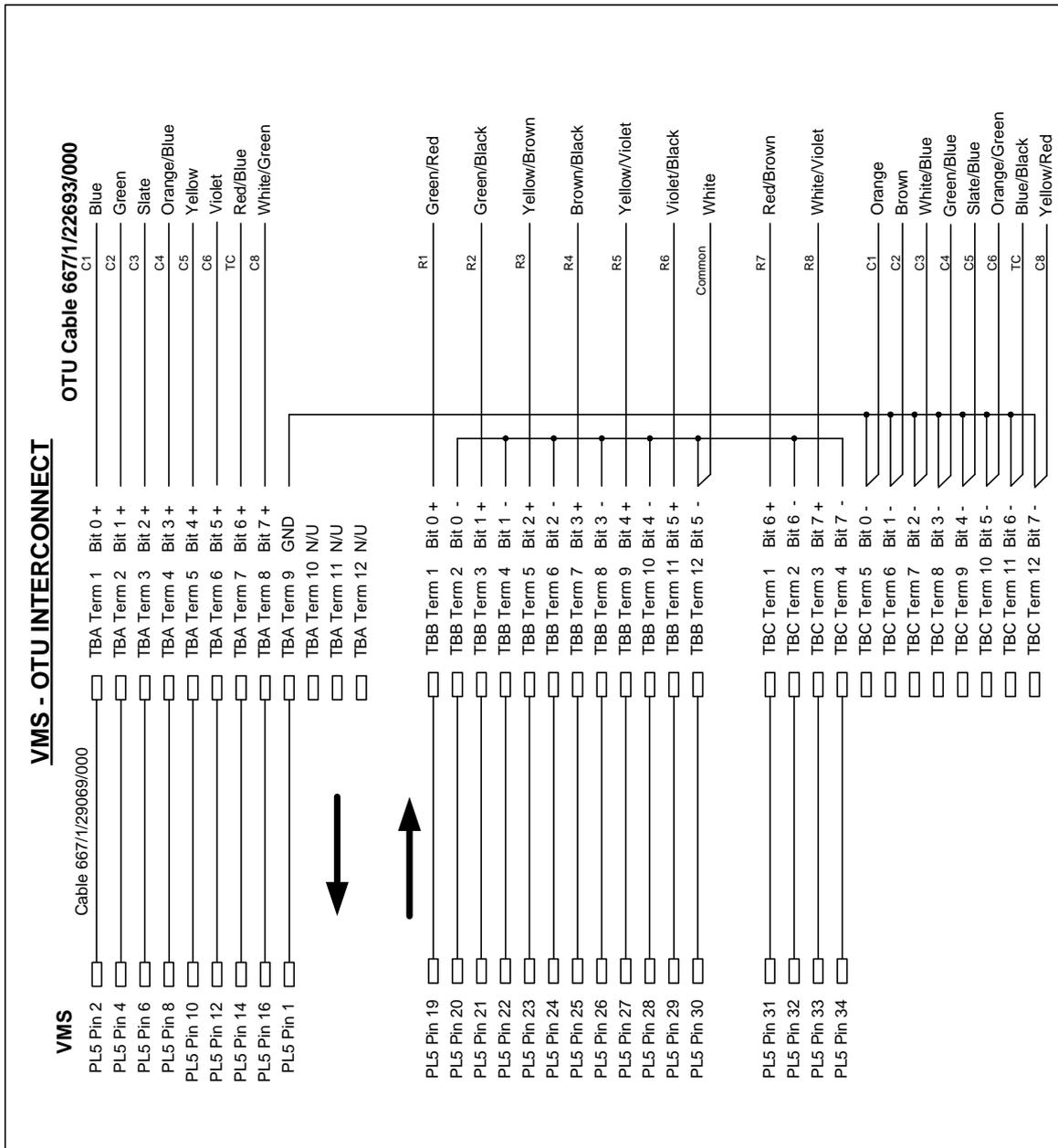


Figure 6 – VMS to OTU Interconnections

5.3 Test Equipment

Refer to section 1.5

5.4 Electrical Strength Tests

A record of the results of the tests detailed in this section should be made on the checklist in Appendix A -

5.4.1 Insulation Test

Preparation

This test is to be carried out prior to connecting mains power to the sign.

Remove the Switch Cover from the mains components.

Ensure the Mains Isolation Switch and the RCD are switched on and that Fuse 1 (labelled on the mains distribution block) is in place.

Test

With the Megger test instrument (set to 500V operation) carry out the following tests:

- Connect between the main ground stud and the Mains in Live terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

- Connect between the main ground stud and the Mains in Neutral terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

5.4.2 Earth Loop Impedance Test

Preparation

After ensuring that the cable is not live, connect Mains to the signs distribution box.

The sign should be switched on and operating normally unless otherwise stated in the following subsections.

SAFETY

During the test ensure that NO person is in contact with any part of the sign, its cabinet or the mounting pole.

Tests

Using an LT5 tester: Connect the Red probe to the Live input at the Mains Isolation Switch and the earth test probe of the tester (Black probe) to the following points in turn and carry out an Earth Loop Impedance Test for each point:

- (a) Main Earth
- (b) The earth pin of the maintenance socket
- (c) The door lock assembly of each access door
- (d) The Electronics Panel
- (e) The mounting pole

- (f) The sign to pole interface mounting plate

Maximum Allowable Impedance (RCD protected)

The maximum allowable earth loop impedance of an electrical installation following an in-line RCD is calculated by using the formula:

$$Z = \frac{50 \times 1000}{I \text{ (mA)}}$$

Where I (mA) is the operating current, in milliamps, for the RCD (i.e. In this case with a 30mA RCD Z can be up to 1666 ohms).

5.4.3 Prospective Short Circuit Current

Repeat the above test between the live and neutral conductors of the incoming supply, (ZL-N). The prospective short circuit current at the origin can be calculated from this reading using the following formula:

$$\text{Prospective short circuit current} = \frac{230V}{Z_{L-N} \text{ at origin}}$$

If this value exceeds 16000 amps refer to Engineering. (In practice, if the LT5 records a value of less than 0.02Ω.)

5.4.4 VMS RCD Tests

This test is performed with the RC500 or similar meter. The test measures the actual disconnection time of the RCD.

- (a) Ensure all mains distribution switches are switched off. Ensure all connections to power supplies, PCBs etc. are correctly made.
- (b) Switch on the Master switch.
- (c) Ensure the Maintenance Socket RCD is switched off. Plug the RCD tester into the Maintenance Socket.
Switch on the Maintenance Socket RCD.
Check that the polarity indicators on the RCD tester are correct.
Set the trip current on the tester to 30mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 200ms.
- (d) Reset the maintenance socket RCD
Set the trip current on the tester to 150mA.
Set the trip current on the tester to 150mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 40ms.
- (e) Switch off the master switch, disconnect the tester from the controller and reset the Maintenance Socket RCD.

5.5 Functional Testing

This section details the testing of a complete UVMS to ensure that the equipment is operational following installation.

During the operational tests specified in this section extensive use is made of the Diagnostic Terminal, which is described in Appendix D - .

Terminal command options are shown in bold as follows:

Control > RT Clock

Means the **RT clock** option from the **Control** menu.

A password is required before some options can be used. This is defaulted as follows:
SIGN ACCESS

Note: Some functions may ask for a second password. These functions are only for Factory use and are not to be used in Site situations.

5.5.1 Functional system test

- (a) Connect a diagnostic terminal to the sign (Skt. 2 on the processor PCB). Check that the sign is configured for RS232 diagnostics: if the switch is set incorrectly, change it and reset the sign by pressing the RESET ENABLE and RESET switches simultaneously.

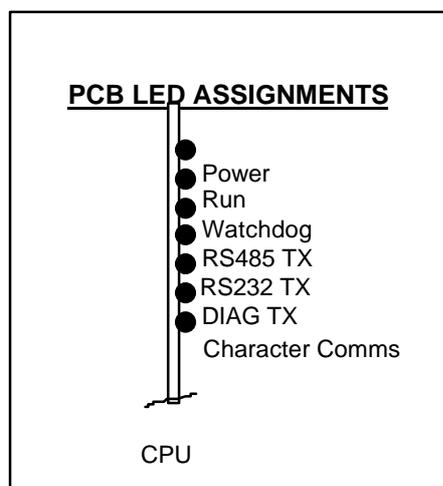
Check that the following LEDs on the CPU PCB are illuminated:

The Power indicator LED

The Run LED (This should flash approximately once a second)

The Character Comms LED illuminates briefly once every five seconds

Check that the watchdog LED on the processor PCB is **not** illuminated.



Use the **Reports > Fault log > Complete Fault Log** to ensure that no unacceptable faults have been detected on power up. See section 6.3 for a summary of faults that need actions.

- (b) Set the real time clock using the **Control > RT Clock** option of the diagnostic terminal.
- (c) Use the **Control > Settings > Set EMS Message** option of the diagnostic terminal. Set the character sequence "ABCD.....XYZ" on the sign (using just enough characters to fill the sign). N.B. Any extra characters on the initial line will blank out the sign.
To enter a new line of characters use CTRL/ ENTER.
Check that the displayed sequence is correct (i.e. all displayed characters are in the correct order).
- (d) Use the **Reports > Monitor Light Sensors** option of the diagnostic terminal to display the status of the light sensors.
Cover the sensors and check that the displayed value for each sensor is less than 3.
Uncover the sensors and check that the displayed value for each sensor is greater than 10.

Signs with Battery Backup only -

- (e) Observe that the CPU PCB and Modem remain powered and then power down 25 ± 10 seconds after the removal of mains power.
- (f) Switch the master switch back on and check the processor PCB Run and Watchdog LEDs as in (a) above.
- (g) Set the battery switch (S1) on the processor PCB to ON/
- (h) **Signs with PAKNET only -**
To register the RP9 Radio-Pad, ensure power is connected and then press and hold the Test Button for 3 to 5 seconds. Only release the test button once the yellow service light has started to flash slowly. Registration is now performed automatically, which may require up to one minute. After registering, the service light remains lit if a radio base station can be found and used.

If the service light is lit, a test call can be made to the network by pressing the test button twice within one second. On the second depression, the service light is extinguished for half a second.

A successful test call is shown by the service light remaining permanently lit after half a second; this indicates that the Radio-Pad is operating correctly. If a fault still exists then check the data cable or the terminal.

An unsatisfactory test call is indicated by the service light turning on and off four more times, finally remaining on. If this happens, then try another

Radio-Pad. If this is still unsuccessful then it is likely that reception is poor and the project engineer at Poole must be advised.

- (i) Test that the Instation can set the sign by contacting the operator and requesting that the sign is set, confirm that the display is correct and then request that the sign is blanked.

NB. After a period without communication from the instation, the sign either blanks or displays a fault message. The period of inactivity (which varies from 10 minutes to 2 hours) and the wording of any message are site specific.

6. MAINTENANCE

6.1 Safety Precautions

Only persons who are suitably experienced and trained to use suitable access equipment must undertake this work.

6.2 Routine Maintenance Procedure

The timetable below refers to a recommended maintenance interval. The actual timetable must be agreed with the regional maintenance controller.

6.2.1 Annual

- In areas of high pollution and dirty conditions the period between cleaning may have to be reviewed depending on site conditions.
Clean using a jet of water only.

Warning: **Do not wipe the front screen as this will scratch the surface, which will affect the sign's optical performance.**

- Signs should be visually checked to ensure that all LEDs on the sign are working correctly. Exercise all pixels on the sign by using the EMS Set Message function of the diagnostic terminal.
- Visually inspect for any paint work damage. Repair as required.
- Re-tighten all fixing screws and nuts as required.
- Check the sign for water ingress where this may affect operation.
Repair as required.

- Check incoming mains cable connector for wear.
- Check the condition of the PCBs (i.e. scorching, corrosion etc.), batteries and fuses. Replace as necessary.
Note: When replacing a battery, the battery label must also be replaced or updated.
- Examine the diagnostic current fault log. Note and rectify any faults reported.
- Check that the outputs of the power supplies are within the following limits:

12v \pm 0.6v

5v \pm 0.25v

If either of these is outside the limits then the power supply should be changed.

6.3 Fault Finding

On arrival at site the first action is to examine the "Diagnostic Current Fault Log" (See Appendix A4.4.3 for details). Any faults found here should be cleared by the appropriate action. Where communications between the sign and the diagnostic terminal cannot be established or the fault cannot be cleared simply, refer to the following tables.

6.3.1 Sign

Symptom	Diagnosis	Action
Sign not talking to Central Office	Incorrect address set at Sign	Set correct address on processor board
	RS485/232 Switch in the incorrect position (switch 4 switch 2).	Set switch to correct position.
	Fault in line between sign and central office.	Find and repair fault.
Sign will not set but will communicate with Central Office.	EMS/EMI switch in the incorrect position (switch 4 switch 3).	Set switch to correct position.
Sign Run LED not flashing and watchdog LED is ON.	EPROMs may be fitted incorrectly.	Check EPROMs.
	Processor PCB faulty.	Replace Processor PCB

Symptom	Diagnosis	Action
Sign Run LED not flashing but watchdog LED is OFF.	Address switch set to 00H or FFH	Set correct address.

6.3.2 Sign Characters

Symptom	Diagnosis	Action
LEDs on a group of characters do not light at all.	Fault on character PCB.	Replace character.
Run light flashes, sign refuses to set, LP7 flashes for long periods	Sign Processor to Character comms failed	<p>Remove connection to all displays, bar one. Wait until the power is removed then reapplied to the characters and LP7 flashes. Check no faults in log for the connected display. Connect another display and repeat until faults on connected display are found.</p> <p>Disconnect the inter PCB connectors on the affected display. Repeat test. If no errors then the fault must be on the second board.</p> <p>Replace the faulty character.</p>

6.3.3 Power

Symptom	Diagnosis	Action
5 volts absent from processor pcb.	Fuse blown.	Replace fuse. Check wiring if new fuse blows
	Faulty PSU.	Replace power supply
12 volts absent from Processor pcb	Fuse supplying battery charger pcb blown	Replace fuse.

Symptom	Diagnosis	Action
	Battery charger pcb faulty	Replace battery charger pcb

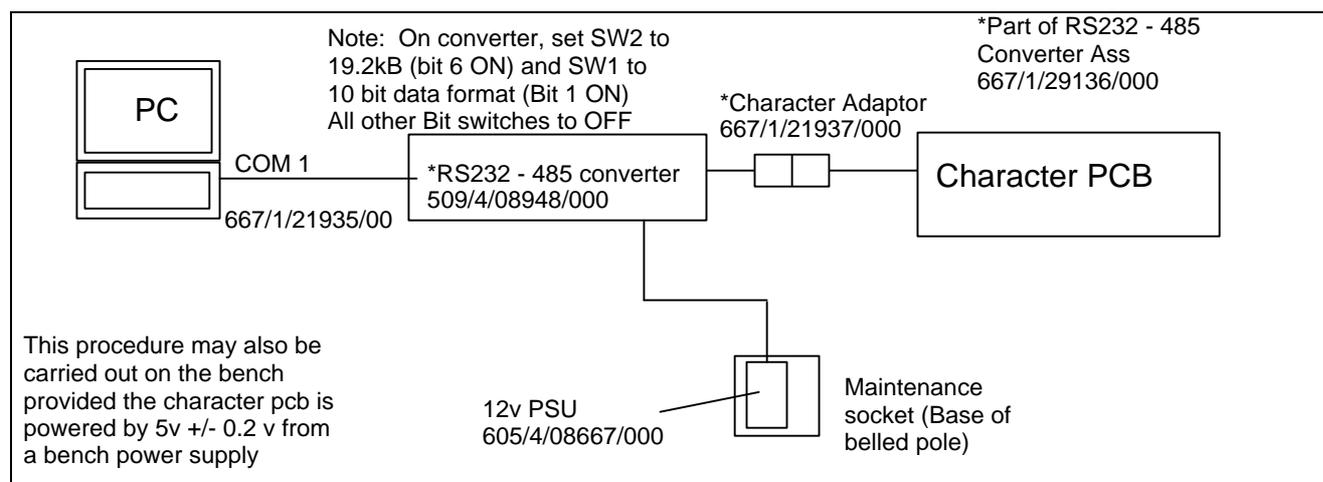
6.3.4 Intelligent Character Testing

6.3.4.1 Introduction

The Intelligent Character Test software (which is part of the Maintenance Kit) allows UVMS Intelligent Characters to be operated directly from a Windows 95/98 PC without using the UVMS CPU PCB. Thus it is suitable for both bench testing of characters and complete signs.

In all cases the program tries to write to and display on as many characters as it can (unlike the UVMS CPU PCB, which only allows a display to be shown if all characters are fault free) regardless of how many may be faulty.

Figure 7 - Intelligent Character Test Setup



6.3.4.2 Setup

Figure 7 shows the setup for the test. The test equipment shown is part of the VMS Maintenance Kit (667/1/29132/000).

1. Power down the sign.
2. Remove the RS485 connection from the CPU PCB.
3. Remove the power connector (PL1) from the CPU PCB.
4. Connect the RS485 flying leads from the Converter to any Character PCB RS455 header:
RED wire to PIN 1

WHITE wire to PIN 2

5. Re-power the sign and run the software.

6.3.4.3 Operation

1st Screen - Warnings and Password

Ensure the warnings are heeded and then enter the password (ICT ENTRY).

2nd Screen - Sign Size

Select the COM port that the Converter is attached to if different from COM 1. Then enter the number of rows on the sign (maximum 4) and the number of characters per row (maximum 12).

3rd Screen - Sign Configuration

Inverted rows do not apply to Siesign 150.

Select the character size (3 per PCB = 150mm)

The program now 'draws' the sign on the screen and data for each line can be entered. Only those letters, numbers and punctuation marks allowed by the HA can be displayed with one exception; entering a # causes all LEDs for that character to illuminate.

The "SEND TO SIGN" button sends the data displayed on the screen to the sign.

The "TEST ALL LEDS" button illuminates all LEDs on each character in turn then re-displays any data.

The DOT below each display shows:

GREEN if the Character is OK

RED if it is faulty

YELLOW as it is being tested

WHITE as data is being sent.

Brightness can be adjusted with the BRIGHTNESS slider and the speed at which the sign is written to can be adjusted using the COMMS SPEED slider, which is useful for slowing down the test sequence.

6.3.4.4 Hints

1. Remember some PCB faults can hog the line so be prepared to isolate sections of the sign.
2. If spare character PCBs are used, they must have their addresses set for the positions that they occupy in the display.
3. Do not forget to re-address character PCBs that are moved about in the sign or they will appear out of sequence (if two character PCBs end up with the same address they will interfere unpredictably).

6.3.4.5 Completion

At the completion of character testing, power down the sign and replace any fuses and connections removed during the test (described in section 6.3.4.2).

Connect the Maintenance Terminal as described in Appendix A and set a message that exercises all characters.

6.4 Replacement of Component Parts

Before replacement of any components takes place, the sign should be completely switched off. Remove the fuse at the base of the pole.

6.4.1 Replacement of Processor PCBs

In the event of a PCB requiring replacement it must be replaced by a part of the same type and the same or higher issue state. Before removing the PCB note all switch settings and configure the replacement PCB in a similar manner. Swap the EPROMs and PLD on the faulty PCB with those from the replacement PCB. In order to replace a PCB, all the connections to that PCB should be removed. The PCB can then be removed from the panel. This is achieved by removing the retaining clips (or screws) at each corner.

When handling PCBs or electronic components, all reasonable precautions must be taken to prevent the damage of components by ESD.

6.4.2 Replacement of Power Supply

The Power Supply Unit is mounted on a sub-panel on the right hand side of the main panel. After ensuring that the mains supply is completely isolated, the procedure for replacement is as follows:

- Remove ELV connections from the power supply
- Remove LV (mains voltage) connections from the power supply

The sub-panel can now be unscrewed from the panel, allowing the PSU to be replaced with a new unit. Replace the sub panel and reconnect the wiring.

Inspect the psu connections and restore the mains power and check the rails as follows:-

12V Rail	12.0 \pm 600mV.
5V Rail	5.0 \pm 250mV.

6.4.3 Replacement of Miscellaneous Panel Mounted Items

All units on the mounting panel are fastened using studs/nuts/washers or rivnuts. In order to remove any item, the necessary fixing must first be unfastened.

Any item that is removed should be replaced by an identical item, identified by its STCL Part No.

6.4.4 Replacement of Characters

The character PCBs are screwed onto power rails. To replace a PCB follow the procedure below:

- Remove the power from the display: This may be done by removing the appropriate fuses in the Driver module or by powering down the whole sign.
- Unclip the inter-pcb connector.
- Unscrew the 4 screws holding the character PCB in place.
- Remove the PCB and replace with the new board. Screw in the 4 screws loosely and align the PCB so that the inter-PCB connectors can be connected.
- Connect the inter-pcb connector and tighten the pcb fixing screws.
- If the pcb has not been pre-configured then follow the procedure in 6.4.4.1
- Use the removed PCB's configuration label, and the configuration terminal to configure the new character PCB. See below for details.
- Fill in the details of the configuration label on the new PCB.

6.4.4.1 Configure New Character PCB

- Disconnect the inter-character connectors.
- Run the "Intelligent Character Configurator" software on a PC as defined in Appendix E. See section 6.3.4.2 below for details of how to set up the PC to operate the software.
- Connect the PC to the replacement character, as shown in Figure 8.

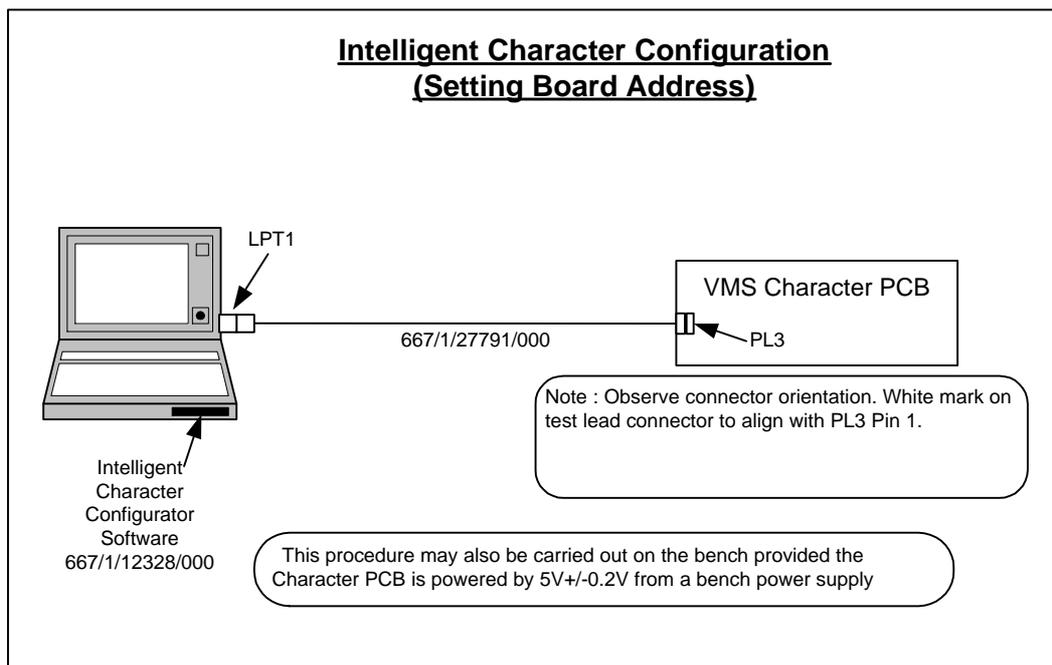


Figure 8 - Configure New Character PCB

- After the opening screen has cleared, click on the File menu and select Configure VMS Character.
- The screen displays the Programmer interface.
- Click on the Default button - this should load the default values for the following fields:
 - address
 - no. of characters per PCB
 - no. of pixels per character – do not change
 - Protocol baud rate – do not change
 - PWM Repetition Rate – do not change
- Enter the address of the character that has been replaced in the address field. This may be found by reading the address label on the rear of the old character.
- Enter the number of characters per PCB (=3)
- Click on the Burn button to program the new character.
- Click OK on the dialog box that appears.
- To verify the burn, click the Read button and check that the contents of the EPROM are as entered.
- Affix a new EPROM label, with the address, to the lower left-hand corner of the PCB.
- Reconnect the inter-character connections.

6.4.4.2 PC Set-Up

In order to run the “Intelligent Character Configurator” software the PC must be set up as detailed below:

From the **Start** menu select **Settings > Control Panels**.
Select **System** from within **Control Panels**.
Select the **Device Manager** tab.
Double click **Port (COM & LPT)** to expand the display.
Select **Parallel Port (LPT1)**
Select **Properties**
Check in the **Resources** tab that the **Input/Output** range is 0378 to 037B.
Select **OK**.

6.4.5 Replacement of Light Sensor

The light sensor is mounted at the top of the sign enclosure. To replace a light sensor perform the following steps:

- Disconnect the red and white wires to the light sensor
- Unscrew the light sensor nut
- Remove the light sensor.

Ensure that any sealing rings are intact. The light sensor can now be replaced. The procedure for replacing the light sensor into the sign is the reverse of the removal procedure.

Once the faulty light sensor has been replaced it should be checked for correct working as follows:

- Connect the Diagnostic Terminal
- Display the 'Monitor Light Sensors screen' and check that the replaced light sensor is giving sensible readings.
- Display the 'Complete Fault Log' and check that an entry has been placed in the fault log showing clearance of the light sensor failure.
- Cover up the light sensor so that the readings are very low.
- Display the 'Monitor Light Sensors screen' again and check that the light sensor is giving very low readings.
- Uncover the light sensor.

Display the 'Complete Fault Log' and check that an entry has been placed in the log that the light sensor variation failure has cleared.

6.5 Spares

6.5.1 Component Parts

The UVMS Signs contain no user serviceable parts except for fuses. In the event of failure the whole faulty item must be replaced with an identical unit. The Siemens part number of each spare part is listed below.

6.5.2 Consumables

Ref	Location	Type	Siemens Part No.
FS1	Pole Base	5A 240V BS88 fuse	518/4/90352/004
		FUSE AUTOMOTIVE 2A 32V Grey	518/4/97046/001
		FUSE AUTOMOTIVE 10A 32V Red	518/4/97046/006
		FUSE AUTOMOTIVE 15A 32V Blue	518/4/97046/007
		Rechargeable battery 12V	418/4/42314/010
	Processor pcb	QB 500mA fuse	518/4/90285/004
	Processor pcb	3V Lithium battery	418/4/97186/000

Warning: Fuses must only be replaced with ones of the correct type and rating. The use of incorrect fuses may irreparably damage the equipment.

Appendix A - PART NUMBERS

Item	Siemens Part No.

Appendix B - SPARES LIST

Item	Siemens Part No.
Processor PCB Assembly	667/1/24620/001
Character pcb	667/1/27891/000
Mains distribution unit	667/1/30570/000
Driver Module	667/1/30330/000
Display Module	667/1/30340/nnn
Power Supply 5V & 12V	667/7/30357/000
VMS Processor board	667/1/24620/001
Relay	507/4/39637/000
Light Sensors	667/7/24680/000
Battery Charger	667/1/28547/000

variants differ in cable length

Appendix C - FUSE RATINGS AND POSITIONS

Fuse	Rating/type	Part Number	Location
Sign Fuse	10 Amp BS88		Base of pole
Driver Unit Mains fuse	5 Amp BS1362	516/4/97022/003	Terminal block inside Driver Case
5v logic supply	2 Amp blade	518/4/97046/001	Driver Module fuseblock position 2
12 volt relay/modem/battery charge supply	2 Amp blade	518/4/97046/001	Driver Module fuseblock position 3
5 volt LED Supply	10 Amp blade	518/4/97046/006	Driver Module fuseblock positions 7, 8, 9
12 volt Heater Supply	10 Amp blade	518/4/97046/006	Driver Module fuseblock positions 4, 5, 6

Figure 9 - Fuse Ratings

Appendix D - Use of Diagnostic Terminal

D.1 GENERAL DESCRIPTION

The Diagnostics Terminal consists of a portable personal computer and installed software that operates on PC running Microsoft Windows 95/98. It has been designed to aid maintenance engineers with the varied day to day interface needs of the different variable message signs. Simple to use menu driven operations enable set-up and maintenance tasks to be undertaken with ease.

Words enclosed by chevrons, e.g. <Enter>, <Esc>, indicate computer keys.

D.2 HARDWARE DESCRIPTION

The hardware required to run the VMS Diagnostics Terminal software is a personal computer (see Appendix E) with a suitable lead to connect to the RS232 serial port of the processor as shown in Figure 10.

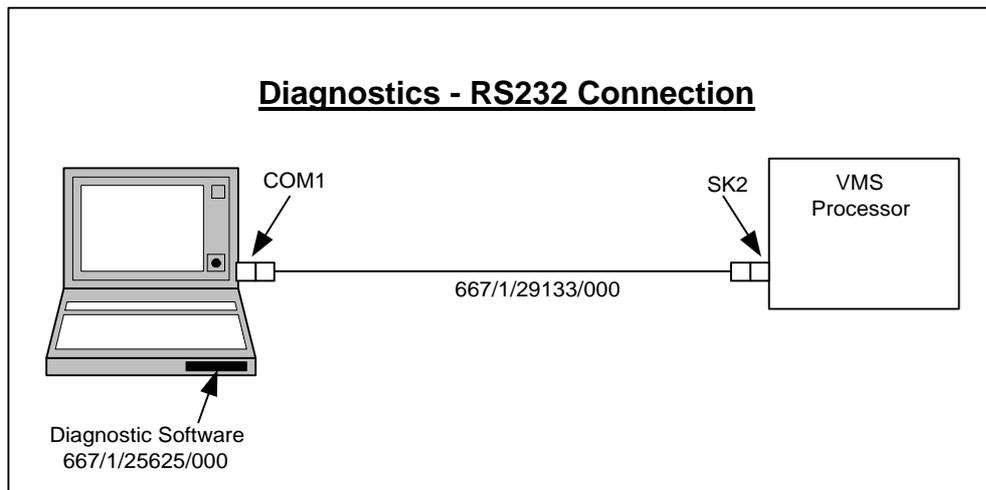


Figure 10 - Diagnostic Terminal Hardware Setup

D.3 GETTING STARTED

D3.1 Introduction

The Diagnostics Terminal software is supplied on a 3.5" 1.44 Mbyte floppy disk. It comes with an automatic installation program called SETUP. This program creates directories as needed and transfers files from your distribution disks to the PC's hard disk. A minimum of 1 Mbyte of disk space is needed on the destination drive for the Diagnostics Terminal software; in addition to space required for any report data files that may be created when the software is run.

It is assumed that MS-DOS and Windows have already been installed on the portable PC and that the operator is reasonably familiar with DOS commands.

D3.2 Installing the Diagnostics Terminal Software

The Diagnostics Terminal software is protected to stop unlicensed versions of the software being generated. The Customer issued disks are limited to a certain number of installations. If subsequent installations are attempted the software fails to be invoked.

To install the Diagnostics Terminal software:

- Boot up the portable PC.
- Ensure that the DOS system prompt is displayed.
- Start Windows.
- Insert the installation disk (Diagnostic Terminal DISK #1 part number 667/1/25625/000) into drive A.

- From **File Manager** select drive A and then double click on the **setup** program.
- Follow the instructions displayed - this involves confirming or changing the destination pathname. The Windows group and icon are all created automatically.

Using Diagnostics Terminal Software on Windows 95

There is an identified problem running the software with Windows 95 that can be overcome in the following way:

- From the **Start** button select **Settings** and then **Control Panel**
- Double Click the **System** icon. This opens a dialog titled **System Properties**
- Select the **Device Manager** tab and scroll down the list until you reach an item labelled **Ports (COM and LPT)**
- Double Click the **Ports** item to show all the COM and LPT ports on the PC
- Select the COM port that is used to connect to the sign, and press the **Advanced** button
- Select the **Port Settings** tab and select the **Advanced** button from the displayed dialog
- Remove the tick from the check box labelled **Use FIFO Buffers**
- OK all the displayed dialogs and close the **Control Panel**.

It is now possible to run the Diagnostic Terminal and connect to the sign via the RS232-485 converter.

Note: Some applications and utilities that make extensive use of the COM port (such as serial printers, or network comms applications) may require this to be re-enabled when used. If other applications use the COM port it is possible to re-enable the FIFO buffering and only disable it when using the VMS Diagnostic Tool. To re-enable the FIFO buffering follow the procedure outlined above, but make sure the **Use FIFO Buffering** check box has the tick enabled.

D3.3 System Start-Up

Start the program from Windows. When started, the terminal attempts to establish a connection with the Sign. If it is unable to do this, the software notifies the operator and exits.

Note: The terminal software must be exited before disconnecting or switching the computer off, as the terminal must establish a disconnect with the Sign.

D.4 USERS' GUIDE

D4.1 Menu Structure

The system is completely menu driven and the various facilities are invoked simply by selecting the required menu option. The following table lists the options available. The number associated with each menu option refers to the section where the facility is described in detail.

• Control	A4.3
Reset Fault Log	A4.3.1
RT Clock	A4.3.2
Settings	A4.3.3
Set EMS message	A4.3.3.1
Set EMI drive code	A4.3.3.2
Set Dim/Bright	A4.3.3.3
Set Lantern Override	A4.3.3.4
Simulator Faults	A4.3.4
Tests	A4.3.5
Test Results	A4.3.5.1
Run Test 2	A4.3.5.2
Heater Test	A4.3.6
Set Password	A4.3.7
• Reports	A4.4
Current Sign Driver Status	A4.4.1
Switch States	A4.4.2
Sign Driver	A4.4.2.1
VMS Sign	A4.4.2.2
Fault Log	A4.4.3
Current Faults	A4.4.3.1
Complete Fault Log	A4.4.3.2
Monitor Light Sensors	A4.4.4
• Factory Self Test	A4.5
Start Factory Self Test	A4.5.1
Stop Self Test	A4.5.2
Report Factory Self Test Results	A4.5.3
Print Self Test Results	A4.5.4
Test RS485 Link	A4.5.5
9600 Baud	A4.5.5.1
2400 Baud	A4.5.5.2
Test RS232 Link	A4.5.6
• MSG Seq	A4.6
Message Sequencing	A4.6.1
• Stop	A4.7
• Exit	A4.7.1

D4.2 Password Protection

Some of the menu options are protected by a password for security reasons. The operator is allowed three attempts to enter a valid password, after which the system aborts the selected option. However, it is only necessary to enter the password just once during a session, i.e. while still in the Diagnostics Terminal. The Simulator Faults,

Factory Self Test and MSG Seq. options are protected by two passwords for additional security.

D4.3 Control

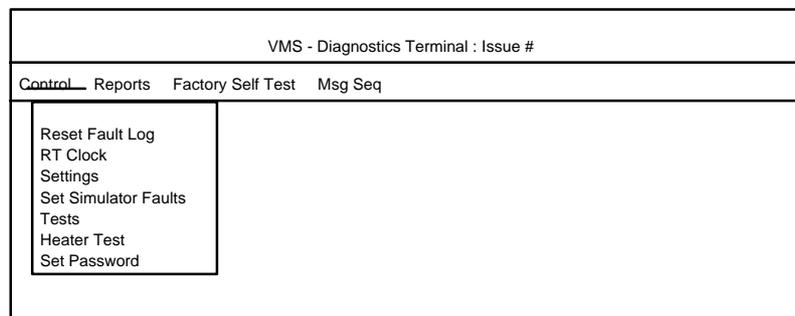


Figure 11 - Control Menu Options

D4.3.1 Reset Fault Log

This facility is protected by a password. On selection of this option, the operator is first prompted to enter the password unless one has been entered successfully during the current session.

Upon entry of a valid password, a dialog box is displayed which prompts selection of the 'Reset' button to reset the Fault Log. Select 'Cancel' to avoid clearance of the Fault Log.

If the 'Reset' button is selected, a message confirms if the Fault Log has been cleared.

D4.3.2 RT Clock

This facility enables the sign clock to be both read and set.

On selection of this option, the sign clock is read and the retrieved data displayed in a dialog box. Then either 'Quit' or change the time and/or date values and 'Send' the changes.

If 'Send' is selected and a password has not previously been entered during the current session, the operator is prompted to do so. When a valid password has been entered, the time and date are transmitted to the sign and used to reset the clock. The clock is immediately re-read and the new values sent back to the terminal and displayed.

Note: The data entry dialog box performs validation checks on the time and date values entered before sending them to the sign. Any errors are notified and the software offers an opportunity to correct them before proceeding. The terminal will not send an invalid date or time to the sign.

D4.3.3 Settings

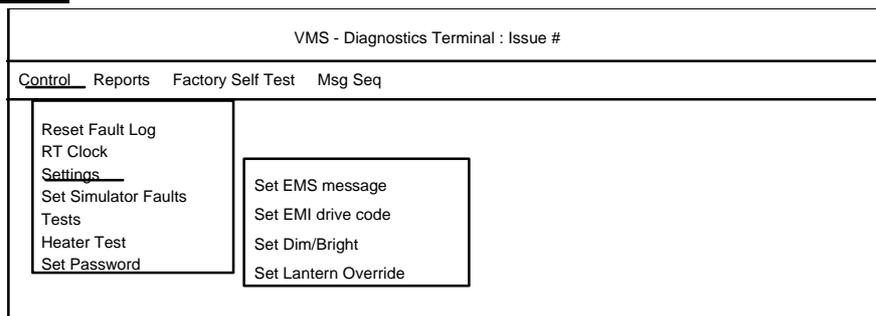


Figure 12 - Control - Settings Menu Options

D4.3.3.1 Set EMS Message

This option enables the operator to set the message on an EMS sign. It is password protected similar to the Reset Fault Log option.

The system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted. Otherwise, the system proceeds and displays STATUTORY WARNINGS that must be read carefully to make sure that all the conditions are met before proceeding. Select 'Cancel' to abort if these conditions have not been met.

This facility enables the operator to set the text message on the sign, together with the lantern requirement (lanterns ON/OFF) and the lantern override switch (ON/OFF). The lantern requirement and lantern override switch are set by means of check boxes; an X in the check box indicates that the option is set to ON.

Note: If the 'lantern override' switch is set to OFF, the lantern requirement setting is ignored.

To specify the text to set, enter the text directly in the text message field, noting that to move to the next line press <CTRL + RTN>. The text will only be set on the sign if it is compatible with the sign's size. There is no error message concerning a set not being accepted.

To set the message on the EMS to one of the stored messages, the first character in the text message field **must** be '#' and **must** be followed immediately by the Stored Message Code (with no intervening spaces or tabs). The Stored Message Code must be in the range 0 to 47, e.g. #25; if it is not within the range an error message is reported (see Appendix A5). The terminal will not send an out of range Stored Message Code to the sign.

This facility is also used to test all the characters on a sign during a routine maintenance visit (see sections 7.2.1 and 10.2.1). This may be achieved by setting all the pixels of all the characters on one row of the sign, asking for a visual check and moving on to the next row. The way to set all the pixels on one character is by pressing <Alt> 0146 at the numeric keypad.

Select 'Quit' to stop setting messages.

D4.3.3.2 Set EMI Drive Code

This option, which enables the operator to set the Aspect on an EMI sign, is not used for UVMS.

D4.3.3.3 Set Dim/Bright

This option enables the operator to set the Dim/Bright level on EMS and sign types. It is password protected similar to the Reset Fault Log option.

On selection of this option, after checking for entry of a valid password, the system displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

The level is set to DIM or BRIGHT by means of "radio buttons", only one of which may be selected at any one time.

Select 'Quit' to leave this option.

D4.3.3.4 Set Lantern Override

This option enables the operator to set the lantern override switch on EMS signs to either ON or OFF. It is password protected similar to the Reset Fault Log option.

On selection of this option, after checking for entry of a valid password, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted. Otherwise, the system displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

The lantern override is set by means of a check box; an X in the check box indicates that lantern override is set to ON.

Select 'Quit' to leave this option.

Note: If the lantern override switch is off, the lantern requirement settings are ignored.

D4.3.4 Simulator Faults

For security reasons this option is protected by two passwords. If a password has already been entered during the current session, only the second password is required.

On selection of this option, after checking for entry of a valid password, the system displays a STATUTORY WARNING that must be read carefully to ensure that all the conditions have been complied with before proceeding.

A dialog box is displayed, with a list of faults relevant to the type of sign connected. If the option has been accessed during the current session, the previously sent faults are highlighted, if the option has not been accessed before, then no faults are highlighted.

A fault can be selected or de-selected by highlighting or un-highlighting it respectively. When the chosen faults have been selected, 'Send' can be selected to send the highlighted faults. None or more faults can be sent. If 'Cancel' is selected the dialog box is refreshed, and displays the faults previously sent (if any). If 'Stop' is selected the option is aborted without sending any faults.

D4.3.5 Tests

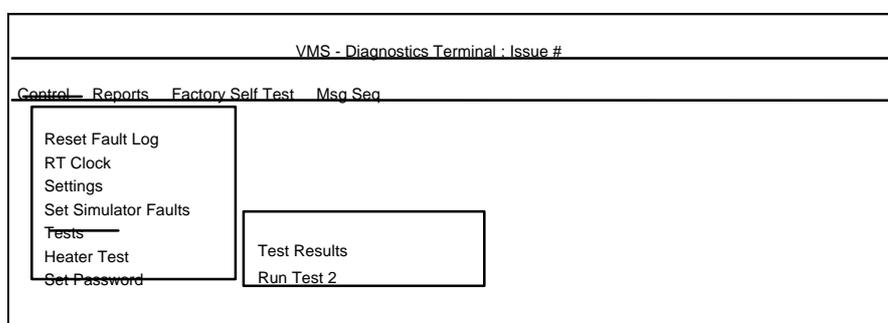


Figure 13 - Control Tests Menu Options

D4.3.5.1 Test Results

This facility provides a simple report consisting of the result of the last Test 2 run on the sign (see Appendix A4.3.5.2). It displays two bytes of data in binary format. It is not possible to save this report to a data file.

On selection of this option, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted.

D4.3.5.2 Run Test 2

This facility enables the operator to run a Test 2 on an EMS. It is password protected similar to the Reset Fault Log option. Test 2 runs the following sequence:

- 1 Checkerboard1 on row1, 'SIGN TEST' on row2
- 2 Checkerboard2 on row1, 'SIGN TEST' on row2
- 3 'SIGN TEST' on row1, checkerboard1 on row2
- 4 'SIGN TEST' on row1, checkerboard2 on row2
- 5 'SIGN TEST' on row1, one block on row2, luminance level 1
- 6 'SIGN TEST' on row1, two blocks on row2, luminance level 2

- 7 'SIGN TEST' on row1, three blocks on row2, luminance level 3
- 7 'SIGN TEST' on row1, four blocks on row2, luminance level 4

Luminance level 1 is the level set when the ambient light is dimmest and level 4 is set when ambient light is brightest.

On selection of this option, after checking for entry of a valid password, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted. Otherwise, the system proceeds and displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

Select 'Quit' to leave this option and the sign is automatically cleared.

D4.3.6 Heater Test (not applicable to UVMS)

This facility enables the operator to force the sign to perform a heater test; it then retrieves and displays the result which is either PASS or FAIL.

D4.3.7 Set Password

This facility enables the operator to reset the password. It is, of course, password protected. On selection of this option, after checking for entry of a valid password, the system displays a dialog box containing two fields:

- New Password.
- Confirm New Password.

Enter the new password in both fields before selecting the 'OK' button.

Warning: The first level password can be changed by anyone with first level password access. Contact Poole site if the password is forgotten.

Note: The password applies only to the machine on which the Diagnostics Terminal software is installed; it is not written to the sign. It is not possible to reset the second level password.

Reports

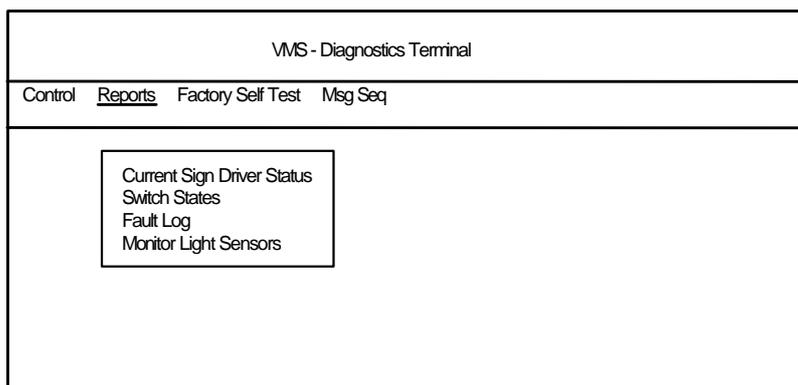


Figure 14 - Reports Menu Options

D4.3.8 Current Sign Driver Status (not normally applicable to UVMS)

This option provides a report of the current sign status. The data is retrieved from the sign driver and, therefore, the terminal must be connected to a sign driver. If no sign driver is connected, an error message (see Appendix A5) is displayed instead of the report. It is not possible to save the contents of this report to a file.

The data retrieved and displayed is:

- Device Mod Code
- Issue State
- Message
- CRC
- Dim/Bright setting
- Lantern Status

D4.3.9 Switch States

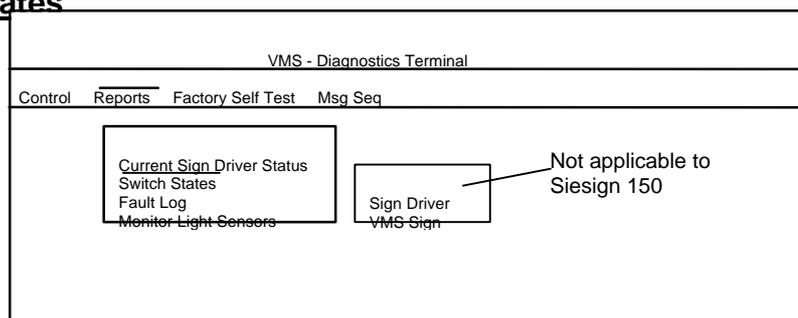


Figure 15 - Reports - Switch States Menu Options

The 'VMS Sign' option facility provides a report of the UVMS Sign 'switch' states. However, the switches reported are not all switches in the common sense of the word. They are as follows:

- Address.
- EMS/EMI (always EMS in the case of Siesign 150).

- Lithium Battery.

The following may appear in a number of fields,

1. N/A - Not Applicable
2. U/A - unavailable

D4.3.10 Fault Log

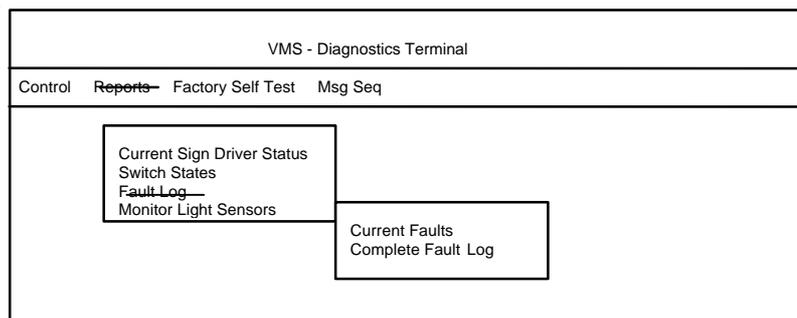


Figure 16 - Reports - Fault Log Menu Options

D4.3.10.1 Current Faults

This facility provides a report of the current faults obtained from the sign. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the 'Save' button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

D4.3.10.2 Complete Fault Log

This facility provides a report of the complete fault history since the last reset. This is obtained from the sign. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the 'Save' button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

D4.3.11 Monitor Light Sensors

This facility provides monitoring of the ambient light sensors. The values are displayed in a dialog box and are continually updated.

Select 'Quit' to leave this option.

Since the data in this report is dynamic, it is not possible to save this report to a data file.

D4.4 Factory Self Test

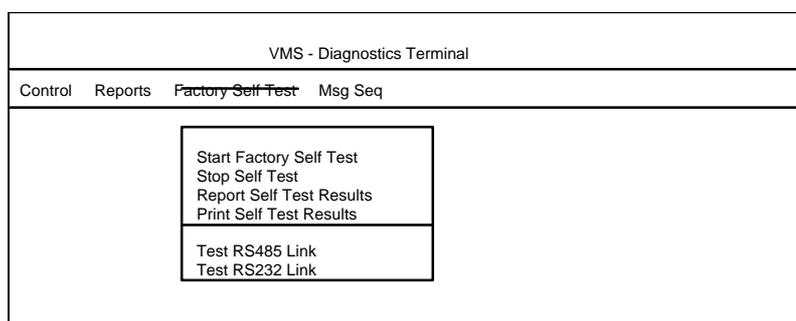


Figure 17 - Factory Self Test Menu Options

D4.4.1 Start Factory Self Test

This facility enables the operator to initiate a Factory Self Test. This test is used to soak test the signs in the factory. Each test consists of five sign settings as follows:

- 1..First set of alternate pixel rows set, lanterns off.
- 2..Second set of alternate pixel rows set, lanterns off.
- 3..First set of alternate pixel rows set, amber lanterns flashing (if fitted).
- 4..Second set of alternate pixel rows set, lanterns off.
- 5..Sign blank, lanterns off.

Once a self test has been started, the sign takes over and performs the actual tests. For security reasons this option is protected by two passwords. If a password has already been entered during the current session, only the second password is required.

Note: This facility must not be invoked outside the factory even if the second password is known.

Before selecting this option, ensure that the UVMS processor and the RS232 Engineers' Terminal port are connected as shown in Figure 10.

Before starting a Factory Self Test, a number of parameters must be entered:

- Lantern type (always amber for UVMS).

- Sign size (number of rows and number of columns).
- Test duration (in hours).
- Cycle time (in minutes).
- Setting time (in seconds).

A maximum value of 255 applies to all these fields.

The '**Test duration**' parameter defines the overall time for the test to run. If the operator enters **0** for this parameter, the sign runs the test cycle **once** only.

The '**Cycle time**' parameter defines how often each cycle is to run during the self test, i.e. the gap between each test cycle. This value must be at least five times the 'setting time'.

The '**Setting time**' parameter defines how long each display remains set on the sign.

The '**Lantern type**' parameter defines which lanterns are tested (red, amber or both). The lantern test requirement is set by means of two check boxes, one for red lanterns and one for amber lanterns. Only the box for 'amber lanterns' should be checked.

All the parameters contain default values when the dialog box is first displayed. These values may be used or replaced.

In addition to the parameters entered, the system obtains the date on which the test is started from the PC and this is added to the parameter list automatically.

The sign size is validated before the test is started and the operator is informed if the size entered is different from that configured in the sign.

The Factory Self Test operates in cycles, each consisting of a set of pre-defined tests. In between cycles, the sign does not display anything and the sign appears to be inactive. The test cycle runs as many times as the overall test duration time allows. Each display that is part of the test (including the lantern test) remains set for the duration of the '**Setting time**' parameter.

When all parameters have been entered, select the 'Start' button to start the test running. Once this has been done, the option may be exited and it is possible to continue working on other options or applications or to disconnect the terminal from the sign.

All faults detected are logged and counted.

The Factory Self Test may only be interrupted between test cycles and the Self Test Results obtained using the **Report Factory Self Test Results** option, (See Appendix A4.5.3). However, a report obtained at this time will obviously be incomplete and contain only the results so far.

It is possible to stop the Factory Self Test in between test cycles using the **Stop Self Test** option (See Appendix A4.5.2).

The Factory Self Test stops automatically at the end of the test duration time.

Stop Self Test

This facility enables the operator to stop a Factory Self Test before it has completed.

Select the 'Stop' button to stop the test or 'Continue' to continue.

Note: Any commands selected during a Factory Self Test will only be accepted if they are sent between test cycles, i.e. while the Sign is Blank.

Report Factory Self Test Results

This facility provides a report of the results of the Factory Self Test obtained from the sign. It may be invoked both during a Factory Self Test and after a Self Test has run to completion.

The report is similar to the fault log report but it also contains a count of occurrences of each fault. It also contains the Device Mod Code and Issue State of the sign together with the self test parameters that were used to start the test. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the 'Save' button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

Print Self Test Results

This facility is provided specifically to make it easy for the operator to obtain a print out of Factory Self Test Results. However, this facility may be used to print any data files that have been created using the 'Save' button in any of the reports.

Test RS485 Link

9600 Baud (Not applicable to UVMS signs)

This facility enables the operator to test the Sign Driver RS485 Link (9600 baud) at the Sign Enclosure. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

2400 Baud

This facility enables the operator to test the Transponder RS485 Link (2400 baud) at the sign. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

Test RS232 Link

This facility enables the operator to test the SAC (Stand Alone Controller) RS232 Link at the sign. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

7. MSG Seq.

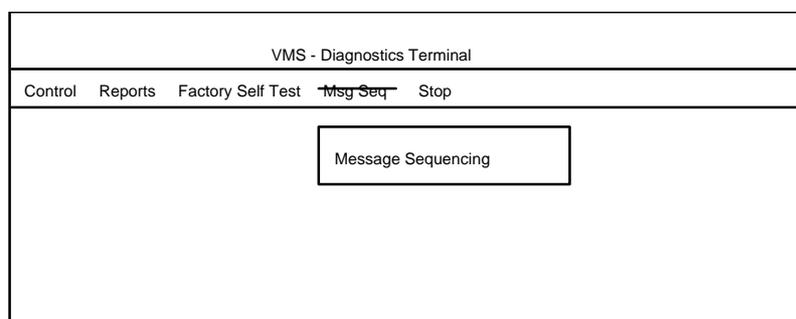


Figure 18 - Message Sequencing Menu

Message Sequencing

This facility enables the operator to initiate a sequence of preset messages to be displayed on the UVMS Sign.

For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

It retrieves and displays the result of the settings, which is either OKAY or FAIL.

Select the 'Stop' button to stop the sequencing. This blanks the Sign automatically.

8. Stop

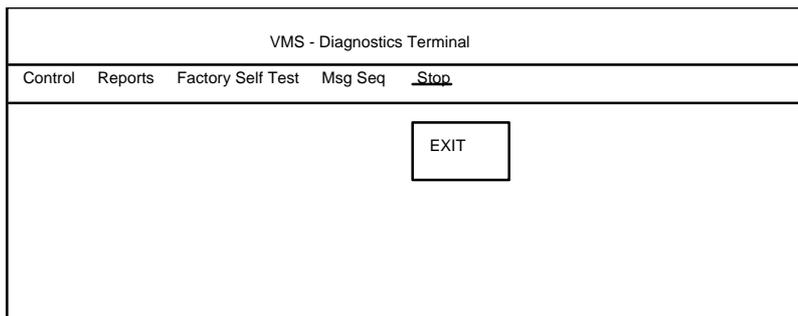


Figure 19 - Stop Menu

Exit

This exits the current Diagnostic Terminal application. The exit function must be confirmed. If confirmed the Terminal tries to establish a disconnect with the UVMS Sign. Only if the disconnect message is replied to correctly does the Diagnostic Terminal Application terminate.

A.2 ERROR MESSAGES

The following is a list of error messages likely to be encountered, where they are likely to be encountered and a brief description of their likely cause.

Unable to Establish a Connection

The Diagnostic Terminal has not received a reply from the UVMS Sign to its connection request messages. Check that the computer is connected to the Sign and to the correct port.

Unable to Disconnect from the VMS Sign

The Diagnostic Terminal has not received a reply from the UVMS Sign to its disconnection request messages. Check that the Sign is still running and that the computer is connected to the Sign and to the correct port.

Error in TIME

RT Clock - either the 'hours' field contains a value greater than 23 or the 'minutes' field contains a value greater than 59.

Faulty Comms reception - sign driver reply corrupted

Most facilities - this usually means that the terminal is not properly connected to the sign.

File with entered name already exists - Please re-enter file name

Reports (when the 'Save' button has been selected and a name for a new file to be created entered) - the file name entered has been found in the data directory \DATFILES.

Invalid entry in DAY field

RT Clock - the value in the day field is either less than 1 or incorrect for the month and year combination, e.g. 31-4-95, 29-2-99.

Invalid entry in MONTH field

RT Clock - the month field contains a value greater than 12 or less than 1.

Invalid Password

All options that are password protected - the password has been entered incorrectly.

Invalid Password - Process Aborted

All options that are password protected - if, after three attempts, the password has still not been entered correctly, this message is displayed and the software then returns to the main menu of the Diagnostics Terminal.

New password and confirm password inconsistent

Set password - the character strings entered in the 'new password' field and the 'confirm password' field do not match; enter the new password in **both** of these fields **before** selecting the 'OK' button.

Number of characters or number of rows is incorrect for configuration

Start Factory Self Test - the sign size is configured in the sign; this message appears if the values entered in the 'number of characters' field and/or 'number of rows' field are not the same as those in the sign configuration.

Self Test Parameter is greater than 255

One of the parameters entered in starting a factory self test is greater than 255.

Setting time and Cycle time contain inconsistent values - please correct

Start Factory Self Test - each cycle contains a number of pre-defined tests, each of which remains set for the number of seconds entered in the 'setting time' parameter; this message is displayed if the 'setting time' is such that the test cycle exceeds the cycle time parameter.

Sign Type is EMS - Red lanterns should not be set

Start Factory Self Test - EMS signs do not have red lanterns; this message appears if the terminal is connected to an EMS sign and red lanterns are selected as one of the lantern type parameters.

Stored Message Code entered is out of range

Set EMS - a Stored Message Code (after the '#') which is either greater than 31 or contains a non-numeric character which causes the code to go out of range (between 0 and 31).

Wrong sign type for function

If the terminal is connected to an EMS sign and the operator tries to select the Set EMI option, this message appears.

A.3REPORTED FAULTS

Fault numbers not included in this table are for design proving only.

The first byte is the fault number,
the second byte is fault category:

- 00 WARNING
- 01 FAILURE
- 02 CLEARED
- 03 FATAL

bytes 3 to 6 are data bytes.

The following are example faults:

- 07 01 00 00 00 00**The mains has failed or been switched off.
- 72 01 5D 01 63 01**Light sensor 1 is showing too little variance (it may be dirty or faulty). The minimum reading over 24 Hrs was 015D Hex and the maximum was 0163 Hex.
- 60 01 01 05 00 00**The sixth character from the left (viewing from the front) on the second row has two pixels with faulty LEDs.

Note: If a fault 11 other than those shown in the following table is logged, the fault and its data should be reported to Engineering.

9. Sign Enclosure Faults

This is a comprehensive list of faults; not all are applicable to all signs.

FAULT	FAULT NAME	DATA1	DATA2	DATA3	DATA4
7	MAINS POWERFAIL	00	00	00	00
11	SD TO SIGN COMMS FAULT	XX	09	00	00
11	SD REQUESTED RESET	XX	08	00	00
35	CLOCK FAULT	00	00	00	00
37	BATTERY FAULT	00	00	00	00
39	LANTERN BULB FAIL	01/02	00	00	00
50	HEATER FAIL	HEATER CURRENT	00	00	00
51	OVERTEMP FAIL	00	00	00	00
53	AMBER LANT PAIR FAULT		00	00	00
54	AMBER LANT CYC STS FAULT	01/02	00	00	00
55	RED LANT CYC STS FAULT	01/02	00	00	00
56	DISK SUPPLY FAIL	00	00	00	00
57	LANT SUPPLY FAIL	00	00	00	00
58	LED SUPPLY FAIL	00	00	00	00
59	LED FAULT	ROW	COL	00	00
60	CRITICAL LED FAULT	ROW	COL	00	00
63	CHAR LED SHORT CIRCUIT	ROW	COL	00	00
64	DISK FAULT	ROW	COL	00	00

65	CRITICAL DISK FAULT	ROW	COL	00	00
66	LIGHT SENSOR1 FAULT	LIGHT LEVEL		00	00
67	LIGHT SENSOR2 FAULT	LIGHT LEVEL		00	00
68	LUMINANCE FAULT	00	00	00	00
72	SENSOR 1 LIGHT VARIANCE FAULT	LIGHT LEVEL MIN		LIGHT LEVEL MAX	
73	SENSOR 2 LIGHT VARIANCE FAULT	LIGHT LEVEL MAX	LIGHT LEVEL MIN	00	00
74	EMI LUMINANCE INPUT FAULT	00	00	00	00
75	RED LANTERN PAIR FAULT		00	00	00
76,77,78	INTELLIGENT CHARACTER FLT	XX	XX	ADDR	00
128	RESTART MESSAGE	00	00	00	00

10. Literal Definitions

SYMBOL	VALUE
XX	IGNORE
01	TOP/LEFT
02	BOTTOM/RIGHT

Appendix A - Test Results

INSTALLATION TEST RESULTS

Site Name:-		Date:-	
Test Equipment Used		TGP Number	
Calibration date			
Multimeter:			
Insulation Tester:			
Earth Loop Impedance Tester:			
RCD Tester:			
Other:			
Insulation Test of Complete Installation (500v)		Mohms	
RCD Test (30mA)	Time:-	Seconds	RCD Test (300mA) if fitted
			Time:-
			Seconds
Earth Loop Fault Impedance:-		Test Results	
Position:-			Ohms

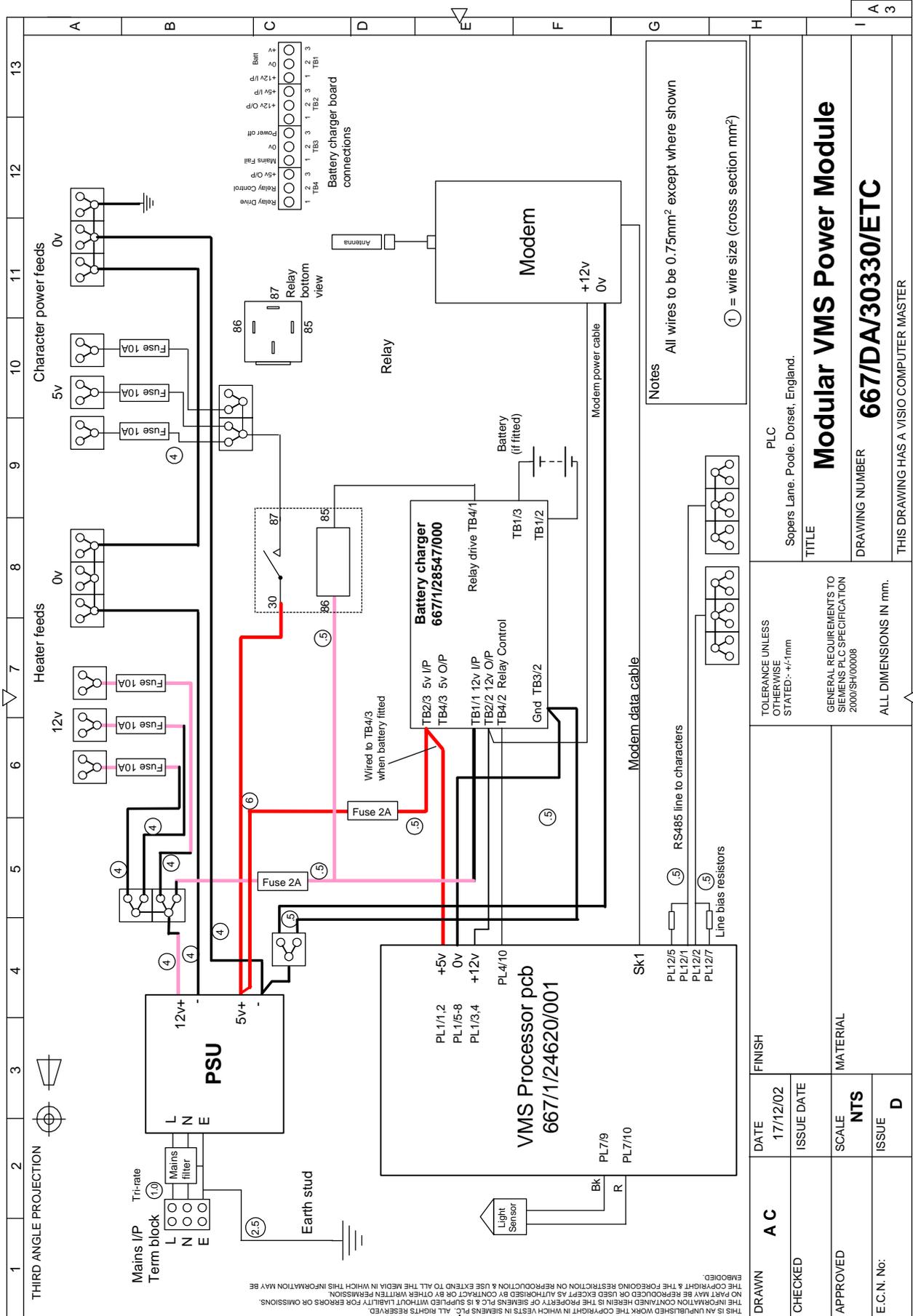
Appendix B - Drawings

667/DA/30330/ETC Siesign 150 Driver Module circuit diagram
667/DA/30325/ETC Siesign 150 Power distribution

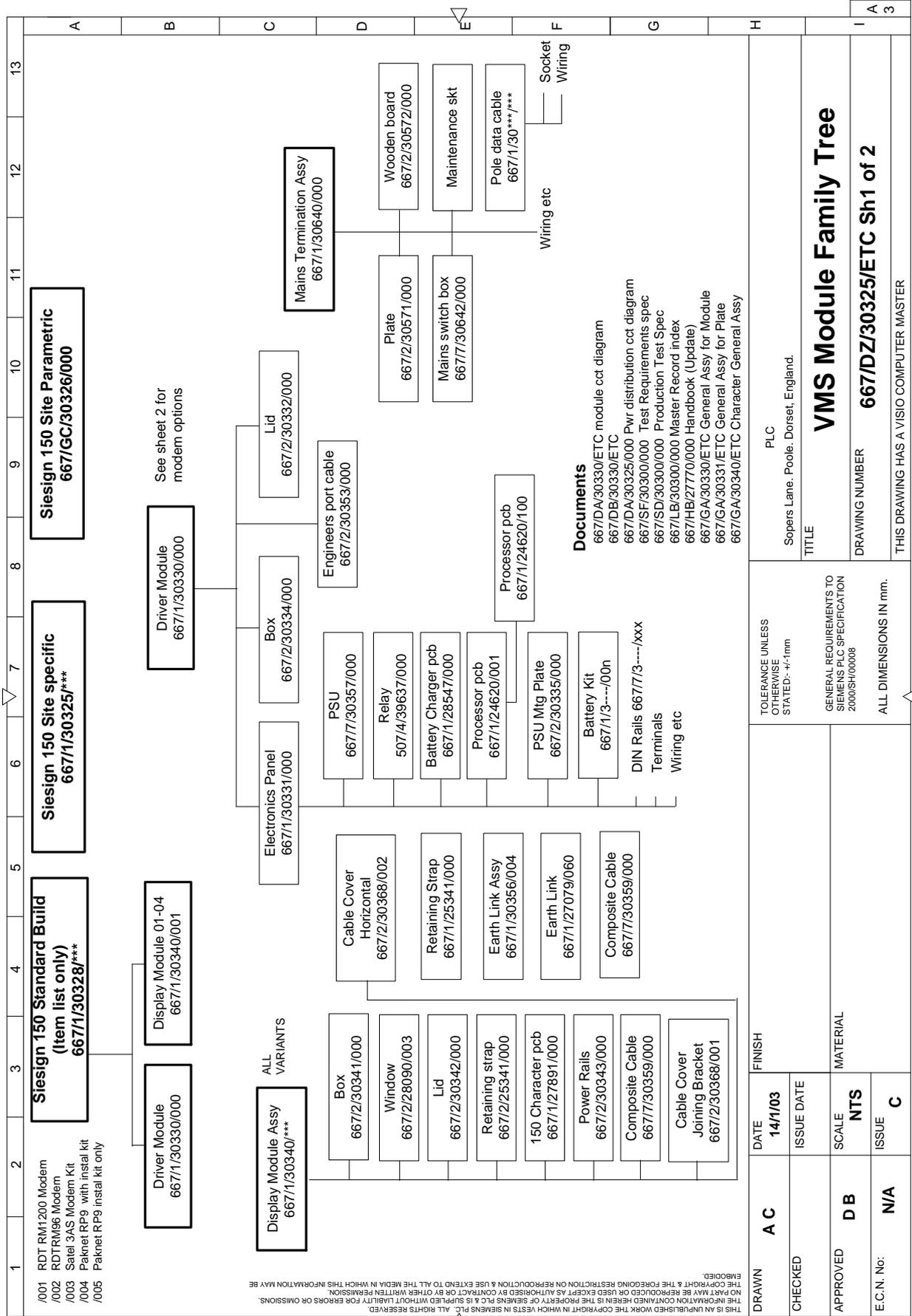
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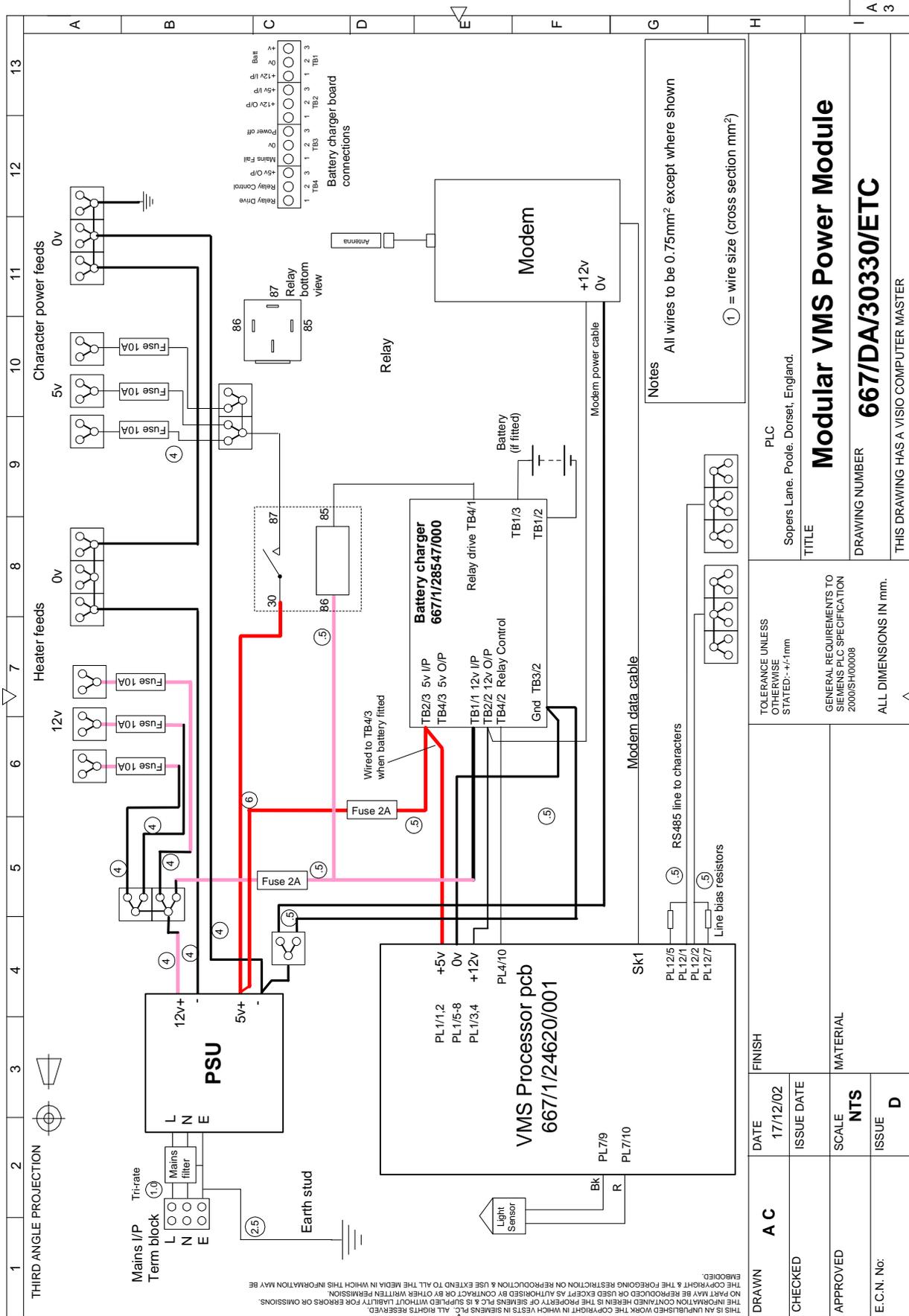
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Drawings



DRAWN	A C	DATE	17/12/02	FINISH	
CHECKED		ISSUE DATE		TOLERANCE UNLESS OTHERWISE STATED	- +/1mm
APPROVED		SCALE	NTS	GENERAL REQUIREMENTS TO SIEMENS PLC SPECIFICATION	2000/SH00008
E.C.N. No:		ISSUE	D	ALL DIMENSIONS IN mm.	
				PLC	Sopers Lane, Poole, Dorset, England.
				TITLE	Modular VMS Power Module
				DRAWING NUMBER	667/DA/30330/ETC
				THIS DRAWING HAS A VISIO COMPUTER MASTER	





Notes
All wires to be 0.75mm² except where shown
① = wire size (cross section mm²)

PLC Sopers Lane, Poole, Dorset, England.
TITLE Modular VMS Power Module
DRAWING NUMBER 667/DA/30330/ETC
THIS DRAWING HAS A VISIO COMPUTER MASTER

TOLERANCE UNLESS OTHERWISE STATED: +0/-1mm
GENERAL REQUIREMENTS TO SIEMENS PLC SPECIFICATION 2000/SH00008
ALL DIMENSIONS IN mm.

DRAWN	DATE	FINISH
A C	17/12/02	
CHECKED	ISSUE DATE	
APPROVED	SCALE	MATERIAL
E.C.N. No:	NTS	
	ISSUE	D